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The Farmer's Digest

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The Farmer's Digest

Volume 14 July, 1950 Number 3

Good Rules for Better Farming

Condensed from Successful Farming

Hadley Read

FROM a distance, you probably couldn't tell the difference between the two farms. They are both in a good, central Illinois community and are only about four miles apart. They are the same size—roughly half sections. The soil rating is almost exactly the same on both farms; and the farm owners are the same age.

These two farms are this much alike, yet over a 22-year period one farm has earned $110,000 more than the other. This means that through depression years, drouth years, and war years, one of these farms has consistently earned an average of $5,000 a year more than the neighboring farm down the road. The difference is in management—good farm management on the part of the farm operator, himself.

M. L. Mosher, farm management specialist at the University of Illinois, isn't surprised by such differences in farm income any more. He's been studying thousands of farm records for more than 30 years. And he says the most amazing fact learned from these studies is that one group of farmers does so much better than another group that the difference in earnings will pay for their farms every 15 or 20 years.

Through these years of study and observation, Mosher has developed a practical, sense-making set of rules or guideposts for good farming. There is nothing new about the points. They are based on the same principles of good farm management that have been taught for a good many years. It's a 10-point set, and every farmer in the Cornbelt has the ability to make use of it.

There's no secret formula in this set of rules—no mysterious,

Reprinted by permission from Successful Farming,
Des Moines, Iowa, February 1950

By checking his work against these 10 points, one farmer has averaged $5,000 a year more than another farmer on a similar farm in the same neighborhood.

1. Plan a sound land-use program
2. Follow a good rotation of crops and arrange a handy field layout
3. High crop yields
4. A suitable kind and amount of livestock
5. Efficient livestock production
6. Carefully planned use of labor
7. Effective use of power and machinery
8. Conservative buildings and fences
9. Pay attention to prices of products bought and sold
10. Have a large enough business for good family living

hard-to-get compounds. The end product, though, is better farming and better farm family living.

Let's take a minute to see how this 10-point set worked on the two farms we mentioned.

Point 1 in the set calls for a sound land-use and conservation program. Mosher emphasizes that this means putting each acre of the farm into the crop for which it is best adapted. It means soil testing and limestone, phosphates, and potash as needed. On rolling land, a good program includes erosion-control measures.

One of the keys to a sound land-use program is soil-building legumes and grasses. It is here that the difference between Farm A and Farm B starts to show. When Mosher pulled together the records for the 22 years (1925 through 1946), he found that Farm A had an average of 27 percent of the tillable land in soil-building biennial and perennial legumes and grasses. Farm B had an average of only 18 percent of the tillable land in legumes and grasses. At the same time, Farmer A used less than half of 1 percent of his tillable land for nonlegume hay and pasture, while Farmer B used nearly 8 percent on his farm.

This sound land-use program, of course, is closely tied in with Point 2—good rotations and field arrangements. Farm A's history on this point goes back to 1918, when Mosher suggested an overall field arrangement and cropping pattern to the present owner's father. The planned program of soil testing, fertilizer, and fitting crops to the land was started at that time. It's been followed ever since.

The payoff for the first two rules is higher crop yields, which is Point 3. Here's what the records tell about yields: For the 22 years, corn yields on Farm A averaged 60.4 bushels per acre—a little over 12 bushels per acre higher than the average of 47.9 for Farm B. The difference in soybean yields is perhaps more striking if not as important. The records for Farm A show an average bean yield of 23.7 bushels per acre, compared with only 15.1 for Farm B. And there was an average of 10.4 bushels per acre difference in the oats yields on the two farms—46.5 for Farm A, and 36.1 for Farm B.

The use of soil-building legumes in the rotation, soil testing, and the use of the right amounts of fertilizer at the right time explain part of this difference in crop yields. But there are other reasons. Careful use of all available manure is one, Mosher says. The use of germination-tested and disease-treated seed of recommended crop varieties is another. And these things must be coupled with careful seedbed preparation, planting, and cultivation, and with the control of weeds, insects, and disease in the growing crops.

While higher crop yields for the top farm go a long way toward explaining that $5,000-a-year difference in income, they don't tell the whole story. Points 4 and 5 deal with livestock and efficiency of livestock production. Records of the two farms on this score help explain more of the difference in dollars.

One way to study the livestock project on a farm is to look at the total value of the feed fed to livestock. Farm A, for example, fed an average of $27.62 worth of feed per acre per year, while Farm B fed only $10.56 worth. In terms of feed, this means that the top farm's livestock volume was more than 2½ times that of the farm down the road.

When we come to kinds of stock raised, the difference in management ability between the two farmers stands out like a sore thumb. Farm A produced an average of 89,000 pounds of pork per year for the 22-year period. Farm B produced an average of only 28,000 pounds. What about profits? With 89,000 pounds of pork, Farm A had an average return of $154 for every $100 worth of feed fed to hogs. Farm B showed a return of only $140. Through all the years, Farm A averaged one pig per litter more than Farm B. And all hogs on the first farm were sold for an average price of $10.30. The hogs on Farm B brought an average price of only $8.58 for the 22 years.

If you wonder about that wide difference in sale price of hogs between the two farms over the

years, Mosher can give you many reasons. Looking back over the records for a recent 10-year period, he found that Farmer A marketed nearly all of his spring pigs in the fall at an average market weight of 234 pounds.

During the same time, Farmer B delayed his marketing until late winter, and even then the average market weight of his hogs was only 208 pounds. At the same time, Farmer A increased the numbers of hogs more during years of higher prices. Earlier farrowing, the use of high-quality breeding stock, well-balanced rations, and attention to health—those are some of the other things that paid off and helped boost the figures on the income side of the ledger.

The records show a similar story for beef cattle and poultry. Farmer A fed an average of $1,688 worth of feed per year to beef cattle and got back $1,935. Farmer B fed exactly the same dollar value of feed to beef cattle, but his return on his feed investment was only $1,527. On poultry, Farmer A returned $155 for every $100 worth of feed fed, while Farmer B returned only $110.

After looking at these livestock figures, it's a lot easier to answer the question, "How does one farm make $5,000 a year more than another?" But we have taken up only half the points in our 10-point program. The others can't be ignored. High income is part of the story, but keeping expenses down is nearly as important. Let's see how the two farms rate on this score:

Take Point 6, for example. This calls for a carefully planned use of labor and for keeping labor costs down. Farm A used $1,643 worth of labor per year, while the labor bill for Farm B was $2,022, or nearly one-fourth more. Why? Again Mosher says there are a number of reasons. Thorough planning of the crop and livestock systems so there is a minimum of conflict between the two will help. So will the arrangements of fields, lots, and buildings. And more labor time can be saved through the use of self-feeders and through feeding cattle and hogs on pasture.

Closely tied up with low labor cost is the effective use of power and machinery on the farm. This is Point 7. Costs on Farm A were kept to an average of $1,227 per year, according to the records. The costs on Farm B expanded to $1,456 per year. There was this difference in machinery costs even though the farms were the same size, with roughly the same acreages devoted to the main Cornbelt crops of corn, oats, and soybeans.

The difference again has to do with care and management of machines. Low machinery cost

means careful purchase of strong, well-built machines to start with. It means having plenty of power for the work to be done and avoiding oversupply of power and transportation units. It means being on speaking terms with the instruction book that comes with each machine and not being afraid to use an oilcan and a grease gun. Protection of machines against weather and livestock also helps cut down repair bills.

There's one other cost item that's overlooked on a good many farms, especially those that don't keep detailed records. That's the cost of buildings and fences—Point 8 in the list. Mosher says that most comparisons of high- and low-earning farms show a larger investment in buildings and fences on the low-income farms.

This certainly is true of the farms we've been talking about. Farm B was over-equipped for the livestock produced. Costs of buildings and fences were a whopping $486 per year compared with $205 for Farm A, which produced more than three times as much pork per year.

When we were talking about the hog enterprise, we mentioned the difference in marketing time and sale prices. That's pretty good evidence that Farmer A paid more attention to prices and price trends, which is Point 9 of Mosher's list. And it goes right along with a study Mosher made a few years ago showing that farmers who attended outlook meetings, studied outlook reports, and kept posted on marketing problems were earning several hundred dollars a year more than those who paid no attention to markets.

Point 10 has to do with having a big enough farm and big enough farm business for good family living. While both farms have roughly the same number of acres, Farmer A has used management ability to increase the size of his farm business; and the payoff certainly has been in better living.

We started off this article by saying that, from a distance, you couldn't tell these two farms apart. But over a period of 22 years they have been $110,000 apart. And the difference has been in the way the two farmers followed the 10-point program for better farming.

Small Doses

Condensed from Nation's Business

Harland Manchester

THERE is a small valley area near Mt. Chocorua in central New Hampshire where, until a few years ago, it was hard to raise good cattle. Feed wouldn't stick to their ribs, their coats got rough, their eyes became sunken, they wobbled around and eventually fell down and died.

The story was that a curse had been laid on the valley cattle back in the days when England owned the land. Whether the tough-minded Yankee farmers really believed the yarn no one can say, but every time a heifer wilted and died, someone retold the ancient legend. Old Chief Chocorua, hailed as a prophet by his tribe, laid the curse as an act of revenge. His cherished son, while visiting a white family, ate something poisonous, and returned to the chief's wigwam to die. Accusing the family of murder, Chocorua went on the warpath and slew the women and children. A posse pursued him to the top of the mountain which now bears his name and filled him full of lead. As he lay dying, he incanted a curse on valley settlers and their stock.

Years rolled by, cattle collapsed regularly, and generations of tourists reveled in the tale. One of these, a Harvard geologist, later visited the government agricultural experiment station at Beltsville, Md., where he told the story to W. O. Robinson, senior chemist in the Bureau of Plant Industry, Soils and Agricultural Engineering. Robinson is an authority on the effects on plant and animal life of so-called "trace-elements" in the soil. He suspected at once that something was the matter with the soil that fed the forage these cattle ate. He obtained verification of the story from the New Hampshire Experiment Station, and procured soil and vegetation samples which were analyzed for their mineral content. The soil was ground to fine powder and burned to destroy organic matter, and the residue was treated chemically to detect the presence —or absence—of various elementary components. Meanwhile Dr. G. P. Percival of the New

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Washington, D. C., December 1949

Hampshire station succeeded in curing some of the sick cattle by adding cobalt to their feed.

As a result of the investigations it was found that the soil was largely composed of coarse granite residue from glacial deposits, and that the valley was indeed cursed—not by old Chocorua, but by a lack of cobalt which is essential in eye-dropper quantities to the health of ruminant animals like cattle and sheep. This discovery was made in 1940. The curse worked for nearly two centuries; now it has been lifted by adding a bit of cobalt to the commercial fertilizer, or, since it does the plants themselves no good, by feeding it directly to the cattle. Less than one part per million in the feed is plenty.

This is only one of many recent applications in agriculture of the new knowledge of trace elements. Since commercial fertilizers began to supplement, and in many cases to supplant farm manures, most fertilizer manufacturers as well as farmers have placed primary emphasis on the nitrogen, phosphorus and potassium—the "big three." The need of certain "carriers," like calcium, sulphur, chlorine and sodium, also has been recognized, but until recently, there the matter ended.

Previous to 1900, Gabriel Bertrand of France had discovered the need of plants and animals for certain minor elements, and pointed out the way for further research, but his findings largely were ignored until the early '30's. Then Brandenberg of Germany found that the heart rot disease of beets was caused by a lack of boron. This stimulated work in several USDA experiment stations as well as in other countries, and today trace elements are in wide commercial use. While it is too early to call this list complete, five minor elements—cobalt, manganese, zinc, boron and copper—are now attracting wide interest as new tools for the improvement of plants and animals.

The Chocorua soil is by no means unique. Throughout the world, hundreds of "accursed valleys" have been found in recent years. For more than a century, cattle and sheep in some parts of Scotland have come down with a similar disease. There they call it "pining" or "daising." Recent studies indicate a cobalt deficiency. In parts of Europe, they call it "enzoötic marasmus" or "Denmark wasting disease." In East Africa, it is "nakuritis"; in Michigan it's the "grand traverse," and in New Zealand and Australia, "Morton's Main disease" or "bush sickness."

A little cobalt has done a lot for New Zealanders. They had been clearing large new areas

and growing big crops by using superphosphates. Many new dairy farms were established, but the cattle came down with bush sickness. In the late '30's the cause was found—cobalt deficiency. Farmers found that if they added to the fertilizer two pounds of cobalt sulphate per acre, at a cost of less than $2, it made the difference between prosperous dairying and no dairying at all. So the disease has been checked in many areas, but that doesn't mean that the whole problem is solved and we can forget about it. Unrecognized cobalt-hunger may be causing a subacute form of the disease in many herds.

Trace element scientists have found in recent years that the need for a dash of manganese in the soil or the feed is responsible for disease in both plants and animals. Only about 15 years ago it was established that a leg bone deformity in chickens known as perosis or "slipped tendon" is caused by manganese hunger. The bones of these chickens, ground up and analyzed, are found to contain about one-third as much manganese as normal chicken bones. Manganese seems to have a great deal to do with sex. Take it away from male laboratory rats and they become sterile; deprive the females of it and they lose their maternal instinct and their mammary glands function poorly. Manganese-hungry bulls are poor breeders.

A wide variety of plant diseases have been found to be caused by lack of manganese in the soil, among them "gray speck" of oats and "marsh spot" of peas. To complicate the problem, there is no correlation, says Robinson, between the amount of manganese in a given soil and the amount found in the plants growing on it. The manganese must be made available for the plant, and that matter is controlled by the soil's nature. Sometimes, by applying 25 to 50 pounds of manganous sulphate per acre, farmers get tremendous crop increases, but there is no standard recipe which can be used in all soils and parts of the country.

Tracking down the cause of a trace element shortage often takes a little detective work. On some farms where tractors have supplanted horses, symptoms of manganese shortage showed up. At first the deficiency was laid to the lack of horse manure; then it was shown that the straw used to bed down horses, but seldom used for other animals, had contained the needed element. In general it is true, however, that the mechanization of farms and the use of commercial fertilizers of high purity—concentrated to save weight in shipment—have

played a leading role in robbing our soil of these indispensable pinches of "pepper and salt."

Last year, 16,000,000 tons of commercial fertilizers were used in the United States to stimulate the soil into high crop production. Some of it contained organic fillers which may have included needed trace elements by accident, but much of it helped to remove from the soil its remaining minor elements, especially on the eastern seaboard with its bumper production and heavy rainfall. More and more, the minor elements are being added to the superphosphates as local needs are being discovered and publicized.

Such infinitesimal amounts of certain trace elements are needed that they are often supplied by accident. There is a story about a western rancher whose orchard was pining away. He had a curious notion that electromagnetic waves from broadcasting stations were blighting it, so he put a circle of wire fencing around each tree to jam the waves. The trees suddenly began to flourish and there was great excitement among the neighbors. An experiment station man interpreted the result differently. The soil, he found, was deficient in zinc, and the rain had washed off some of the zinc from the galvanized wire.

Similar happy errors have been made by scientists. About 15 years ago, California peach trees and grapevines were assailed by the "little leaf" disease, which no one understood. W. H. Chandler, then at the University of California, thought the ailment was caused by a deficiency in iron, so he sprayed some test trees with iron sulphate, with excellent results. Other scientists tried to duplicate his experiment and failed. Then it occurred to him that he had used galvanized-iron buckets for the job, and that the zinc in the coating had done the trick. Since then, it has been shown that zinc hunger is responsible for diseases in many plants, among them citrus, pecan, apple, pear, apricot, tung, and walnut trees; wheat, barley, beans, buckwheat, garden peas, and tomatoes.

When Dr. Cheng Tsui of the University of Wisconsin grew tomato plants in a culture solution free of zinc, they reached a height of a few inches and then stopped growing. He added a trace of zinc and they resumed their growth. Supplementary zinc is now in wide use, especially in fruit orchards. It may be added to the fertilizer, a solution may be sprayed on the foliage, or a small zinc tack may be driven into the trunk.

The elusive nature of these little traces of chemical seasoning make laboratory work most ex-

acting. When plants are grown in a controlled solution from which a single element is excluded, to determine whether a deficiency disease will develop, a few parts per million of the element may enter the solution by means of the water, the chemicals, the sand, or one of the containers used, and falsify the results of the experiment. In trace element field tests at the U. S. Nutrition Laboratory at Ithaca, N. Y., plots are weeded by hand to prevent contamination by metal tools. As the working surfaces of plows, harrows, cultivators and hoes wear thin, the metal is obviously added to the soil. Who knows the effect on plant and animal health of tool metals of various compositions?

Dr. Frank A. Gilbert, trace element research man of the Battelle Memorial Institute. reports that when milk is pasteurized by means of heated copper equipment, the copper content of the milk is increased slightly. Which prompts the speculation, perhaps not too fantastic, that the metallurgist may some day play an important role in nutrition.

For many years boron, now known to be needed in small quantities by many plants, had a bad name in the United States. During World War I, when American potash first was used extensively for fertilizer, it contained an overdose of borax which was toxic to plants, and so boron was anathema to farmers until 1931, when Brandenberg found that a little of the element was essential. While American scientists were following up his lead, a New Jersey truck farmer brought some horse-radish roots to the experiment station at New Brunswick, and explained that sauce made from them was full of black specks and couldn't be sold. Dr. Firman E. Bear and his colleagues had just finished a study of the boron needs of New Jersey soils, and were able to guess at the trouble. The farmer applied borax to his field, and the black specks in the horseradish disappeared.

Since then it has been found that a little boron prevents not only heart rot and dry rot of sugar beets, but also internal cork of apples, top rot of tobacco, cracked stem of celery, and internal browning of cauliflower. Several years ago, alfalfa growers in heavily farmed eastern areas were troubled with yellowing of the crop. A little boron took care of that. It calls for miserly use, like garlic in a salad.

For example, an acre of soil to the depth of one foot weighs about 4,000,000 pounds, and one pound of pure boron per acre has been recommended for tobacco.

Surveys show that vast areas are deficient in boron, including all of North Carolina and Ten-

nessee, Alabama and New Jersey, southern New York and much of New England, while a belt across northern Michigan, Wisconsin and Minnesota is suspect, as well as large areas on the Pacific Coast.

Copper is another of the mysterious trace elements without which plants and animals do not thrive. It helps the body to utilize iron in the formation of hemoglobin in the blood, and it also appears to perform a function in the liver.

For many years in Denmark and Holland a so-called "reclamation disease" or "yellow-tip" has affected grains and forage grown on newly reclaimed heath and moorland soils.

In the early '30's plant scientists found that the disease could be cured by adding copper sulphate to the soil.

It was also known that cattle which lived on this forage came down with "licking sickness," characterized by debility, loss of appetite, and low hemoglobin content in the blood. When the cattle were dosed with copper sulphate, they recovered as the plants had.

Meanwhile the "die back" disease of citrus fruits (death of the young growing tips) was found to be caused by copper hunger, and the use of copper sulphate in certain soils increased the yield of tobacco, lettuce and onions. It must be used carefully, because too much copper will stunt plant growth.

Other trace elements, essential in small amounts, may be toxic if mixed with the soil by nature or man with too lavish a hand. A dash of molybdenum is essential to many plants—more than a dash may poison animals. The most notorious toxic element is selenium, which rots the hooves of cattle in large areas in the West, and is a serious problem in the Republic of Colombia.

Despite the new surge of interest in these indispensable dashes of seasoning, knowledge of where the trace elements go and what they do in plants and animals is still sketchy. But the atom bomb brought agricultural scientists a new tool—the radioactive isotope, and it is already being used dramatically in several laboratories to trace the progress and behavior of the minor elements in crops and livestock. By this method, "brother" atoms of the various elements are "tagged" with radioactivity at the great nuclear research centers, so that when a Geiger counter—the sleuth of the atomic age—is placed near them, it reveals their position by ticking like a clock.

Dr. C. L. Comar and his colleagues of the Florida Agricultural Experiment Station have fed radioactive cobalt to cows and have followed its course

through their bodies, listening for the tell-tale ticks from the animal's organs, meat, hide, hair, and excretions. They have found that the cobalt plays a part in the functioning of the cow's rumen, and that it can't store it up but gets rid of most of it within seven days—important facts to dairymen.

Other tagged atoms are added to culture solutions which nourish laboratory plants. Dr. P. R. Stout of the University of California fed tagged zinc atoms to tomato plants and later exposed photographic plates to slices of the fruit, thus allowing the "broadcasting" atoms to show for themselves where they have congregated and to give hints as to their function.

"There are many studies," says Dr. L. A. Maynard, formerly of the U. S. Nutrition Laboratory, "showing that fertilization with a given mineral increases its content in a specific crop in a specific location. Other studies, however, have shown that the results do not hold for the crop in the same area another year, or for other crops grown in the same location the same year."

In other words, there's a great deal to find out. Any bright young student who is looking for a fascinating career as a pioneer in science would do well to consider this field. He might succeed in conferring upon the world the greatest boon of the century—more food production with less fertilizer.

Sawdust Mulch Will Boost Blueberries

Sawdust mulch on blueberries doubles the yield, and saves a lot of work, too. You can't beat it.

That's what folks at Rhode Island State College have decided after their last experiment with blueberry mulches.

All bushes got the same treatment as far as fertilizer and pruning were concerned—but for four straight years the sawdust-mulched bushes far out-distanced the others. So if you can get some sawdust, give your blueberries a three or four-inch mulch, and look for bigger and more berries.

—Farm Journal

Wood Becomes A Cash Crop

Condensed from Capper's Farmer

Ralph L. Foster

NO LONGER is the wood lot a forgotten "forty" where the owner cuts winter stove wood and occasionally shoots a squirrel. It is a tract that contributes an imposing share to the annual farm income. Wood is becoming a cash crop. Tree Farming is a new business in America.

Signs of this new business hang by the entrance gates of selected farms in 23 states. The words "Tree Farm" are lettered in white on a green background. The man who displays this sign is proud that he is working an organized plan of conserving one of America's dwindling natural resources. He has a tract of timber that will be devoted to continuous growth of salable forest products. He will maintain the land in trees and protect them from fire, disease and insects. He will cut the timber so production will be continuous.

Let's have a look at a Tree Farm. Here is one with a 92-acre wood lot in Stark county, Ohio. Warren H. Bowman is owner. When President James Madison signed the original deed to a Bowman ancestor in 1812, much of Ohio's 25,000,000 acres of virgin forest was untouched. Trees were obstacles in the way of cultivation.

Thru the years the Bowman farm has provided much of its own timber needs. But recently the wood lot has taken on new importance. Over $6,500 of wood products have been sold in the last 3 years. Christmas trees, cordwood and sawlogs have been the principal harvest from 47 acres of natural growth timber and 45 acres hand planted. His planted forest contains white and red pine, black walnut and tulip trees. Christmas trees come from thinnings of the white pine stand.

The American Tree Farm System began in 1941. Bowman's 92-acre wood lot is a part of 18 million acres of timber certified in Tree Farms in 8 years. State forestry departments, the U. S. Forest Service, farm organizations, county agents, state agricultural colleges and business groups help promote the Tree Farm idea. The movement is encouraged by the American Forest Products Industries, a non-profit organization. Inspection and certification of Tree Farms are done by state forestry associations. Instruction and

Reprinted by permission from Capper's Farmer,
Topeka, Kansas, September 1949

guidance in good wood lot management are given by state and federal forestry specialists.

There is good reason for this accumulating interest in small farm timber tracts. Lumber is costly. Demand for wood is climbing. America is coming to the end of its virgin timber era. To supply demand of wood users, timber must be treated as a crop—planted, protected, harvested and planted again.

Farmers own 30 percent of our tree land. Of 461,000,000 acres of commercial forests, 139,000,000 are owned by 3,250,000 farmers. The average farm woodland contains 43 acres. Three-fourths of the pulpwood used in papermaking in the United States last year came from farmer-owned forest tracts. Farm timber tracts haven't been cut as carefully as larger forests. Cutting has been unorganized.

Effort of the Tree Farm program aims to stop waste and improve the tree stand. A co-operating farmer has the help of forestry experts in marking his trees for selective cutting. Wood lots are not grazed because pasturing destroys seedlings. A common fault of farm forests is lack of young trees to replace old ones.

Tree farmers are demonstrating that it is practical to grow timber for sale and farm use. Net labor income on a 33-acre woods of Everest Allyn, Portage county, Ohio, averaged $10.20 an acre a year from 1911 to 1943. George A. Lockard, Ross county, built a 6-room house in 1939 with lumber from his 12-acre woods.

When Ray Ascham, Hancock county, Ohio, built a new barn and machinery shed he put 27,000 feet of his own lumber into them. The 44- by 130-foot stock barn took 7,000 feet of 2 by 12's sawed from home-grown logs. Ascham's 80 acres of woods contain 1,000 sugar maples which bring him around $2,000 a year from syrup.

Ohio Tree Farms are favored in state taxation. The Ohio legislature passed a law which permits the county auditor to reduce taxes 50 percent on the forest land that has met Tree Farm requirements.

Alabama, where farmers own 37 percent of woodland, was the first state to join the Tree Farm movement. Alabama farm woodland is increasing in value thru good management. Value of marketable timber in a Tree Farm tract in Autauga county has increased from $19 to $39 in 10 years.

Arkansas, Oregon and California were other states joining the system in 1942. The next year Washington and Idaho came in. The 1944 group included North Carolina, Montana, Texas, Mississippi and Wisconsin. Florida, Ohio, New Jersey, Tennessee and South Carolina joined in 1946. In 1947, New Mexico, Virginia and

Pennsylvania became Tree Farm states, and the 1948 list included West Virginia, Maryland, Massachusetts and Georgia.

Michigan and Missouri started a Tree Farm program last year. Fifty Michigan timber tracts, most of them farmer owned, have been inspected for 1949 certification. Iowa and Minnesota are other Midwestern states where interest in cash timber harvests is growing among farm wood lot owners.

Texas has one fourth of its 10 million acres of privately owned forest land in Tree Farms. It is one of the few states where timber growth now exceeds the cut.

Feed It To Death!

Condensed from What's New In Crops & Soils

Wilbert Schaal

BROOMSEDGE, the curse of thin, unproductive pasture soils, can be easily whipped—according to the Virginia Agricultural Experiment Station. High soil fertility, particularly nitrogen, is the answer.

Contrary to what has been believed for many years, broomsedge does not crowd out the more desirable grasses and legumes in permanent pastures. The truth of the matter is, say research men at the Southwest Virginia Field Station, that when the soil becomes poor, the good species die out and broomsedge, which flourishes on a thin mineral diet, takes over the land.

In one Virginia experiment, a field that contained at least 75 percent broomsedge was treated with the equivalent of 600 pounds of 8-8-8 annually for 5 years. At the end of this time, the broomsedge had disappeared. The field had a vigorous, luxuriant stand of bluegrass and white clover, and it hadn't been reseeded.

Controlling broomsedge was just as simple as that.

Nitrogen seems to be most important in eliminating the weed. When 400 pounds of 0-12-12 or 0-0-12 were applied to adjacent plots, without the use of any nitrogen, eradication was not so complete.

Mowing and burning of broomsedge, often tried by farmers in an effort to control the weed in permanent pastures, didn't do any good in the Virginia tests. In fact, burning hindered the growth of beneficial grasses and legumes, and the broomsedge came back thicker than ever.

Neither mowing, burning, nor plowing alone, get at the real root of the broomsedge problem—low fertility of the soil.

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How Much Grain For Dairy Cows

Condensed from The Maryland Farmer

Logan T. Wilson, Ph.D.

ONE of the keys to profitable milk production is the efficient regulation of the amount of grain feed for each individual cow. This is so important that a number of years ago the U. S. Bureau of Dairy Industry and Bureau of Agricultural Economics obtained the cooperation of 10 of the agricultural experiment stations scattered throughout the country, in order to get answers to this question.

The practical results of this study were published in a simplified form during the war, when there was an urgent demand for more milk production. They are found in Bureau of Agricultural Economics, Extension Flier No. 2

Suggested quantities of grain to be fed per cow, daily, under varying price conditions.

Section A—Daily Production of Milk, Testing				Section B—Quantity of grain to be fed when grain price is—				
3½% fat	4% fat	4½% fat	5% fat	1½ times milk price	1¼ times milk price	Same price as milk	¾ of milk price	½ of milk price
Pounds milk	Pounds milk	Pounds milk	Pounds milk	Pounds grain	Pounds grain	Pounds grain	Pounds grain	Pounds grain
11	10	9	8	2	2	2	3	4
17	15	14	12	4	4	5	6	7
22	20	18	16	6	6	7	8	10
28	25	23	21	8	8	9	11	13
33	30	27	25	10	11	12	13	16
39	35	32	29	12	13	14	16	19
45	40	36	33	14	15	16	19	22
50	45	41	37	16	17	19	21	25
56	50	45	41	18	19	21	24	
61	55	50	45	20	21	23		
67	60	54	49	21	23	Feeding over 25 pounds is rare in commercial herds.		

Reprinted by permission from The Maryland Farmer,
Baltimore, Maryland, November 1949

"Feeding to Produce More Milk for Victory." The supply of milk is now more plentiful, but efficient economical production is just as important as ever.

Recommendations for grain feeding as given in this government publication are shown in the table.

The amounts of grain shown are to be fed along with 1.8 lbs. of good hay per 100 lbs. body weight or its equivalent in other roughage. Three pounds of silage is usually equivalent to 1 lb. of hay. With ordinary roughage 2 lbs. of hay or its equivalent per 100 lbs. live weight is recommended.

To use this table one must know each cow's average daily milk production and approximate butter fat test, and the price of grain feed in relation to the price of milk. For example with a cow giving 35 lbs. of 4% fat milk, and grain feed and milk prices both at $3.50 per 100 lbs., it would pay to feed 14 lbs. of grain feed per day. For the same cow with milk worth $4.65 per 100 lbs. and grain feed at $3.50 (¾ of the price of milk) it would pay to feed 16 lbs. of grain.

This table emphasizes two things about grain feeding. One is that it pays to feed plenty of grain to cows of high production capacity but not to low producers. The old rule of thumb that simply says feed 1 lb. of grain to 3½ or 4 lbs. of milk, is not very efficient. By it, low producers are over fed and high producers underfed. Even worse is to feed all cows about the same amount of grain regardless of production, which too many dairymen do. It has been shown repeatedly in D.H.I.A. work that 10 to 15% more milk can be produced, without any increase in feed cost simply by adjusting the amount of grain to individual cows according to production.

The other point of emphasis is that the most profitable amount of grain to feed also depends on the price of milk in relation to the cost of grain feed. Most dairymen realize this in a general way, but this table has been worked out to give a more accurate guide as to how-feeding should be adjusted to prices.

All feeding rules should of course be used with some judgement and not followed to the letter. Cows that start out in very thin condition should be fed a little heavier than otherwise. No cow should be fed more than she will take without going off feed. The good dairyman is one who keeps high producing cows, uses a good, well balanced ration, and feeds carefully, up to the cow's most profitable level.

How To Get Water From A Weak Well

Condensed from Electricity on the Farm

If a well is not producing an adequate supply of water, there may be several reasons for it. First, of course, is that the water just is not in the ground. Or your well may have failed to intersect a waterbearing stratum or pocket. If you have been getting a small flow, it may be that the well is in tight gravel or has punctured only a thin stratum of water bearing material. Or fine sand or silt may be clogging your well screen.

There are several things which may be done in an effort to improve the supply. You can deepen the well, hoping to strike more water or a more open water bearing stratum. With shallow wells, there is also the possibility of putting down several wells 20 feet or more apart and connecting them all to one pump. You can use a non-clogging screen.

Blasting a well sometimes opens up a larger underground reservoir in which water can collect; or it may open up water bearing layers. Blasting should be done only by men experienced in that work. Otherwise you may ruin the well.

Using a time-switch on a pump enables one to operate the pump until the water is all drawn out of the well or underground reservoir, then stop pumping while it fills again. The time switch may be set to start and stop the pump so as to get the maximum amount of water out of the well without sucking air. The proper setting of the switch will have to be determined by trial.

There is another way to adjust a pump to keep water coming from the well as fast as it flows in and without sucking air. With piston pumps one can sometimes substitute a larger pulley for the one on the pump, or a smaller pulley for the one on the motor, or both. This will give fewer strokes per minute and consequently less water.

The capacity of centrifugal and jet pumps should not be reduced by slowing their speed. They should be run at rated speed to pump efficiently. If the capacity is to be reduced, it may be done by throttling the discharge. This means putting a valve in the discharge line and closing it until the discharge is just equal to the flow into the well.

If you get into difficulty with your water supply, it is always a good plan to get in touch with your pump dealer and/or well driller. With his knowledge of local conditions he may be able to put his finger on your difficulty and give you quick help.

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New York City, New York, May 1950

Harvesting Grass Silage

Condensed from The Michigan Farmer

B. R. Bookhout and K. A. Vary
Michigan State College

FARMERS are showing an increasing interest in grass silage as a means of utilizing part of their hay and pasture crops. Questions are raised as to the harvesting costs and also as to the equipment and methods necessary to handle grass silage. In order to answer some of these questions cost records of harvesting grass silage were kept on 130 Michigan farms during 1949.

The study showed that field chopping equipment was used on 93 per cent of the farms putting up grass silage. Older types of equipment such as the hay loader and stationary silo filler were used on the other farms. The average costs of harvesting a ton of grass silage with the different types of equipment are shown in the table at the end of the article. The wilting method of putting up grass silage was used by most farmers. No preservative is needed when forages are wilted to between 65 and 70 per cent moisture before ensiling. Those who failed to ensile forage at the proper moisture content had poorer quality silage. Two-thirds of the farmers studied used no preservatives. Cost figures do not include any charge for preservative. If a preservative had been included the cost would have been increased about $1.50 to $2 per ton of silage.

Since the use of stationary choppers is the older method of handling silage the costs of using this equipment will be discussed first. The average cost of harvesting a ton of silage using a hay loader and silo filler was $4.75. This includes all the work involved from the time grass was cut in the field until it was in the silo. The charge for labor was the largest cost item which made up over one-fourth of the total harvesting cost. This points out the major reason why farmers do not like to handle grass silage with this type of equipment. It takes a lot of time and a lot of hard work to handle the green forage. The hardest job is pitching the forage from the load into the silo filler.

The usual crew for harvesting grass silage with a hayloader and silo filler consisted of 3 men. The

Reprinted by permission from The Michigan Farmer,
Detroit, Michigan, May 6, 1950

men usually changed around, one man was stationed at the silo to unload the wagons by pitching off the loads. The other 2 men loaded the wagons in the field and hauled them to the silo filler. The crew of 3 men with 2 wagons and 2 or 3 tractors put from 2.5 to 3 tons of silage into the silo in an hour's time.

Farmers using the hay loader-silo filler equipment often reported difficulty timing mowing and ensiling operations so as to get the cut forage into the silo at the proper moisture content. Frequently much of the forage was put into the silo too dry. One farmer solved this problem by having a man stay in the field while the loaded wagon was being hauled to the barn and the empty wagon was being brought back. During this time the man left in the field had the time to mow one or 2 swaths around the field. In this way it was possible to ensile the forage at about the proper moisture content as the wilting time was held nearly constant for all the fields.

Farmers who use field chopping equipment showed the lowest cost in harvesting grass silage. The average cost per ton was $3.34 or about 30 per cent below the harvesting cost on farms where the hay loader-silo filler method was used. Field chopping equipment enables farmers to chop and load forages with a minimum of hand labor.

A majority of the farmers employed some type of unloading device in their wagons. As a result the labor charge per ton of silage in unloading was only about one-half as great as where hay loaders were used and loads had to be pitched into the silo fillers. Farmers with choppers had about the same charge for use of equipment as those with the hay loader and silo fillers. Apparently these farmers had sufficient use for the choppers to keep the cost low.

The cost of using field chopping equipment varied from farm to farm. Major causes resulting in variation were (1) amount of investment, (2) hours of use in a year, and (3) the organization of the work.

Farmer's equipment investment with field choppers divided into 2 groups. One group had smaller type equipment with an investment of about $1500 for the chopper and blower. The other group had what was classed as larger type equipment with an investment of about $2500 including the chopper and blower. The group with the smaller choppers usually had 2 wagons while the group with the large choppers used 3 wagons. Average investment in self-unloading wagons was about $350 for each wagon. This made a total of $2200 invested in special forage harvesting equipment for the group with the smaller choppers and $3650

for the group with the larger choppers. In most instances only 3 tractors were used by the farmers in both groups so there was little difference in the investment for power. Usually 2 of the tractors were owned by the farmer and one was borrowed or used in exchange with a neighbor.

A second closely related cause of variation was the hours the equipment was used in a year's time. Unless forage harvesting equipment is used over 50 hours a year the cost of maintaining the equipment becomes excessive. Analysis of the cost records indicate that farmers should have about 75 hours of work or more before they can afford the small field chopping equipment. With the large field chopping equipment a farmer should have not less than 125 hours as a minimum.

With the above in mind this raises the question of how many hours a field chopper is used on any one farm. The best way to answer this question is to take an example of the normal use likely to occur on a farm of a given size. A Michigan dairy farmer with 15 or 20 cows and the usual amount of young stock would need to harvest around 75 tons of hay and about the same amount of silage. He would also harvest 25 to 30 tons of straw. If he used field chopping equipment, it would take him about 90 hours with one of the small choppers. With the larger chopper it would take him only about 60 hours. Therefore on a farm of this size the farmer could reasonably afford to own one of the smaller choppers but he would need nearly twice as much work before he could justify economically the purchase of one of the larger choppers. It should be pointed out however, that some farmers would prefer to buy the larger chopper because they can get the work done in a shorter time which sometimes means they can harvest the entire crop at a more optimum stage of maturity. Some farmers plan to do custom work for other farmers in addition to their own and therefore favor the larger type of equipment.

The farmers included in this study had about the same harvesting cost per ton of silage with either owned or custom hired field choppers. This means that on the average custom rates are about in line with the cost of owning the equipment. The usual custom rates were $10.50 per hour with small equipment and $12.50 per hour with large equipment. On small farms the advantage of using the equipment can be obtained at a lower cost through custom hiring rather than owning the equipment. On large farms there would be an advantage to owning the equipment.

Another cause of variation in cost of using field chopping equipment was the organization of the work. Close coordination of men and equipment is necessary to utilize the full capacity of the equipment and keep the cost of operation as low as possible.

The harvesting of grass silage requires a different organization than the harvesting of hay. In hay harvesting enough of the field is cut to keep the hauling crew busy for a day or more. With grass silage the work must be organized so that the cut forage does not become too dry before ensiling. On a good day only from one to 3 hours of wilting (sunshine) is required. This means that only as much forage should be cut at one time as can be handled in the next 2 or 3 hours. Examples of good coordination and the mowing and hauling work were found on several farms. Usually enough forage was cut in the morning to keep the crew working until noon. Just before noon enough forage was cut to provide work for the first half of the afternoon. In the early afternoon the forage to be hauled the last half of the afternoon was cut. Some farmers combined the mowing and raking by hooking a rake behind the mower. A better method that is gaining in popularity was the use of a windrower attached to the cutter bar of the mower. This eliminates the raking operation and reduces the number of stones in the windrow that might cause trouble in chopping.

The most common combination of equipment and crew used was the chopper blower, 3 tractors, 2 wagons, and 3 or 4 men, depending on whether a man was in the silo at all times. When work was well organized there was little wasted time and a minimum of waiting in the field or at the barn. The chopper was considered to be the key piece of equipment and the work was usually planned to keep the chopper going most of the time. When adequate power was available, chopped forage could be unloaded in less time than it took to load. This means that where the work goes smoothly, the load could be brought from the field, unloaded, and the empty wagon returned to the field without keeping the chopper waiting. Ordinarily a third wagon is not necessary unless the field is so far from the silo that the time spent traveling is excessive.

Many types of unloading devices were used. The type of unloader did not make much difference in the speed of unloading. The capacity of the blower with the power available determined the unloading time. All types of unloaders required a man at the

blower to keep the silage feeding in evenly without plugging.

Types of unloaders most commonly found on the farms studied were the canvas unloader and the false end-gate unloader. Either type worked well. The farmers with canvas unloaders reported they felt that it took less power to move the load. The farmers with false end-gates reported that they considered the low original and maintenance expense to be the major advantage of the false end-gate unloader. Some have built special wagons with conveyors in the wagon. Most of these wagons do a good job but their cost usually is rather high and the wagon and rack are very heavy even when not loaded. A few farmers did not have unloading wagons. These farmers found that 2 men could pitch the load off as fast as the blower could handle the green forage.

COST OF HARVESTING A TON OF GRASS SILAGE

Cost item	Hay loader and silo filler	Field chopper	
		Owned	Custom hired
Mowing and raking	$0.63	$0.42	$0.40
Filling costs:			
Labor	1.63	.89	
Power	.90	.76	
Chopping and filling equipment	.94	.99	$2.85
Hauling equipment	.64	.28	
	$4.74	$3.34	$3.25

Year-round Green

Condensed from Better Crops With Plant Food

R. Y. Bailey
Soil Conservation Service, South Carolina

FARMERS in the South are learning to keep land green in summer and winter. To do this, they are using perennial summer legumes and grasses in combinations with annual reseeding winter legumes and grasses. This double cropping system keeps the land fully protected and gives a long season of grazing for livestock.

Sericea, kudzu, Johnson grass, Coastal Bermuda grass, and the narrowleaf Bahia grasses (Pensacola and Wilmington) are the most widely used perennials. Tall fescue has been seeded on several sericea fields and has shown much promise. Reseeding crimson clover, wild winter (also called Caley and Singletary) peas, grandiflora vetch, manganese bur clover, Italian ryegrass, and rescue grass are winter annuals that have shown most consistent ability to volunteer in thick stands when grown in combination with a perennial grass or legume.

Sericea and reseeding crimson clover have made excellent ground cover and furnished a long season of grazing at several experiment stations and on a large number of farms. This combination has grown well on soils ranging from heavy clays to deep, loamy sands.

Best results have followed where sericea was seeded a year or two before crimson clover was planted. Medium late dates of seeding, about October 15 in the middle South, have given better stands of clover than very early planting. Inoculated clover seed has been sown on sericea stubble following mowing or grazing. Seed was covered lightly by a section harrow or similar implement. Good stands also have come from seeding on the surface without any covering.

Farmers who have used sericea and reseeding crimson clover on the same land like this mixture for pasture. H. Owen Murfee, Jr., Prattville, Ala., is one of several farmers in that locality each of whom has several hundred acres of upland planted to this mixture. He reported 340 days grazing per year from this mixture, which is a very long season

Reprinted by permission from Better Crops With Plant Food, Washington, D. C., April 1950

for an upland pasture to furnish feed. An increasing number of farmers in several Southeastern States are planning a high percentage of their upland pasture land to sericea and are sowing crimson clover the following fall or in the fall of the second year.

Like all new mixtures, this one requires some special management. Several farmers already have found that where this double cropping with legumes was practiced, the accumulation of nitrogen stimulated summer weed growth. Owen Murfee is trying rescue grass, tall fescue, and Harding grass in mixtures with reseeding crimson clover on sericea. He believes these grasses will use the extra nitrogen and reduce weed growth the next summer.

Results in the Land Utilization Project of the Soil Conservation Service at Dalton, Ga., at the State Hospital farm, Goldsboro, N. C., and on a number of farms in several different states have indicated that rescue grass will volunteer fairly consistently in such mixtures without the land being disked.

Italian ryegrass grows vigorously and produces a large amount of good winter pasture when grown in mixture with reseeding crimson clover. It usually volunteers best where the surface of the soil is disked in late summer. Annual disking of sericea land is not a good practice because the disks injure the sericea plants and thin the stand.

Tall fescue has been sown on land after a stand of sericea was one or more years old and has made satisfactory growth wherever the grass seed was drilled an inch or a little less into the soil in the fall while there was a good supply of soil moisture. A few cases have been observed where sericea and fescue were sown together early in the spring and good stands of both developed. It is usually better, however, to seed the fescue on land where sericea has grown one or more years and built up organic matter and nitrogen in the soil. Fescue plants have developed somewhat more slowly on sericea than on other areas where a good seedbed was prepared and liberal amounts of nitrogen fertilizer were applied. Fescue on sericea has made exceptionally good growth the second year, after its roots were well developed.

Fescue plants usually have failed to survive the first summer drought where sericea was neither grazed nor mowed. For this reason, it is advisable to confine fescue seedings on sericea to areas that are to be pastured or mowed for hay. It does not fit well in a system where sericea is grown primarily for seed. A few plantings have been observed where tall fescue and a reseeding

legume like crimson clover or wild winter peas both were sown on sericea land. The mixture has looked promising to date, but more time will be needed to get any final answers on such combinations.

Wild winter peas have been seeded on several established stands of sericea, and this legume has added to the density of the ground cover in winter and furnished good pasture in late winter and spring.

Good results with wild peas and sericea have been observed at several places in Mississippi. The commissioners of the Newton County Soil Conservation District bought a small, eroded hill farm and planted the cropland fields to different mixtures. Wild winter peas and sericea were used in one field for spring and summer hay. Peas were harvested for hay early in the spring and sericea in the summer. Observations there and elsewhere have shown that wild peas bedded down in the spring and did considerable damage to the stand of sericea if neither grazing nor mowing was practiced. The kind of mowing is important. Very close mowing prevented peas from making seed. Where the cutter bar was set to leave stubble about five inches high, enough short vines were left to make plenty of seed for reseeding.

Another combination that is being tried under nursery conditions is a summer mixture of sericea and Pensacola Bahia grass and a winter cover of either reseeding crimson clover or wild winter peas. Sericea and Bahia grass have grown well in mixtures on small areas of the Soil Conservation Service nursery at Americus, Ga. Both reseeding crimson clover and wild winter peas have grown well as winter covers on Bahia grass. Combinations of these plants may give us green cover and a long season of grazing on sandy uplands. Such combinations are mentioned here only as possibilities that as yet have not been fully tested in our observational nursery program. A few observational seedings of sericea and Wilmington Bahia grass also have been made on farms.

Grazing management is an important part of these double-cropping systems with sericea and other plants. Best volunteer stands have come in the fall where sericea was mowed for hay or grazed fairly close in late summer. Where very dense sericea was left uncut, volunteer stands of the winter plants often were late and thin. Likewise, sericea needs protection in the spring. As pointed out in connection with wild winter peas, very dense growth of one of the reseeding legumes that is neither grazed nor mowed for hay sometimes tends to mat down and smother sericea plants.

Where reseeding annuals are

pastured in the winter and spring, it is necessary to regulate the rate of stocking so that these plants will make seed. In mixtures that include wild winter peas, stock should be taken off before the seeds pods begin to fill. The seed of this legume contains an alkaloid that is toxic to livestock. Animals that were left in the fields where peas were making seed sometimes became stiff in their hindquarters. These animals usually recovered when moved to other pasture.

Proper grazing management of sericea also is important. Several fields where good stands of sericea were weakened and thinned by continuous close grazing have been observed. Sericea is like other plants in that both roots and tops are necessary for normal growth. Excessive grazing, therefore, reduces the amount of feed produced, in addition to weakening the stand of sericea.

Another combination that keeps the land covered with green plants and makes good pasture is Johnson grass and wild winter peas. Sometimes farmers use the peas for winter and spring pasture and harvest the Johnson grass for hay in the summer.

Johnson grass is seldom planted in the South because it is a weed pest on cropland. There are, however, many thousands of acres on which there is a thick stand of Johnson grass. The addition of wild winter peas greatly increases the pasture and hay from such land.

Coastal Bermuda grass and either reseeding crimson clover or wild winter peas make a combination that furnishes excellent pasture from about the first of December until frost kills the grass the following fall. The date that winter grazing begins depends largely on fall rainfall. When there is plenty of rain in September to get crimson clover started and then enough in October to keep the plants growing, grazing sometimes can be started as early as the first of November. When fall rain is lacking, clover often furnishes little grazing until after Christmas. Wild winter peas start a little more slowly than crimson clover and usually give little grazing until after Christmas.

Manganese bur clover has made excellent growth in combination with Coastal Bermuda grass in the Coastal Plain of Georgia. Bur clover starts to grow early in the fall and makes early winter and spring grazing. It also beds down in a rather heavy mat if it is not grazed in late spring. This tends to smother the Bermuda grass and sometimes thins the stand.

Kudzu makes pasturage of good quality and is very useful during periods of dry weather in the summer and fall. It also grows well on rough, steep land. Kudzu gives almost complete protection

against erosion and greatly increases the percentage of rainfall that is taken into the soil. It tends to suppress brush and certain weeds. This makes kudzu particularly desirable for land that is too rough for convenient mowing.

Kudzu usually is pastured only during dry summer and fall periods, and its grazing season is rather short. A winter crop that would volunteer each fall, keep the land green in the winter, and give a longer season of grazing would add much to the value of kudzu land. Several farmers have seeded wild winter peas on their kudzu land and have been pleased with the amount of late winter and spring pasture it has given.

F. E. Williams of Columbiana, Ala,. planted kudzu on five acres of Montevallo shale in 1941. He seeded wild winter peas on this land in the fall of 1943 and peas have volunteered each fall since. He pastures dairy cows on his kudzu and peas from about October 1 each fall until late March or early April. Mr. Williams estimates that this combination has furnished pasture for at least two cows per acre over a period of 5½ months during each of the past five years. In discussing it, he said, "I figure that I get more grazing at less cost per acre from the kudzu-Caley pea combination than from any other grazing crop on my farm. And, this is from land that was practically waste land when the kudzu was planted."

W. J. Bailey, Montevallo, Ala., has a 15-acre field of good cropland that he planted to kudzu in 1939. He began mowing the kudzu for hay in 1942. In raking kudzu hay, wild winter peas were dragged along by the rake and scattered from a small patch where they had been planted the year before kudzu was planted. Peas are now over the entire 15 acres and come up in thick stands in the fall. Mr. Bailey uses his kudzu for hay or pasture, whichever he needs most. In 1948, he pastured 40 beef cows on the 15 acres from the first of August until frost on a basis of two weeks on kudzu and two weeks off. On February 15, 1949, he turned 40 cows in this field and left them until May 10. On July 24, he harvested a little more than a ton of kudzu hay per acre from the field and had enough new growth by the end of September for a considerable amount of fall grazing.

Reseeding crimson clover and grandiflora vetch are volunteering in thick stands on kudzu at the Soil Conservation Service nursery at Thorsby, Ala. Grandiflora vetch appears to be particularly well adapted for some of the sandier soils where spring drought sometimes seriously limits the growth and seed production of wild winter peas.

An unfortunate misunderstanding about kudzu and sericea has been the idea that these are *poorland* crops. It is true that both of

these deep-rooted perennials have grown on some poor soils, sometimes with little fertilizer. In all too many cases, however, stands have been weakened by overgrazing or mowing and underfeeding. The result has been a few years of hay or pasture and then back to broomsedge.

All of the forage and grazing crops mentioned in this article must be fertilized properly if they are to grow, either alone or in combinations with other crops. All of the winter legumes mentioned here respond to liming, on soils that need lime. Where it is not convenient to get a laboratory test to find how much lime is needed, a ton or two of ground limestone per acre usually is a safe amount. A ton of finely ground limestone per acre on sandy soils and two tons on the heavier-textured soils may be applied early in the spring before reseeding crimson clover if wild winter peas are to be seeded in the fall. If this liming is repeated about once every five years, the needs of the winter legumes usually will be met.

All of the legumes require phosphate and potash fertilizer. About 500 pounds per acre of 0-14-10 or 0-12-12 fertilizer each year will keep both the summer and the winter legumes in vigorous condition. On the sandier soils where crimson clover is grown, about 10 pounds of borax per acre usually are beneficial. Combinations of plants that give long-season pasture on eroded uplands will pay good returns for regular applications of fertilizer.

One of the more interesting observations of these combinations of plants has been the effect the build-up of soil fertility has on the growth of the annual legumes. As an example, crimson clover and Italian ryegrass were seeded on a field in the Land Utilization Project of the Soil Conservation Service at Ackerman, Miss., in the fall of 1948.

All of the land in this project was purchased because it was considered too poor to be farmed economically. On a portion of this particular field where kudzu was planted several years ago, ryegrass and crimson clover made excellent growth in the spring of 1949. On a portion of the field where there was no kudzu, clover and ryegrass did not make enough growth to cover the ground. Fertilizer treatment was alike over the entire field. This serves to illustrate the importance of planting the perennial legumes first and following with the annual legumes and the grasses after the land has been manured and improved by the perennial.

The wide variety of warm-season and cool-season plants that we have in the South gives us combinations to fit many different soil

conditions. These conditions range all the way from the heavy clays of the Black Belt to sandy loams and even deep, loamy sands of the Coastal Plains. By making use of adapted combinations, we can put a great many acres of idle land to productive use.

Good Weeds Are Dead Weeds

Condensed from California Farmer

Dr. George Eby

PITY the lonely weed in San Joaquin County. The County Agricultural Department has specialized on its destruction. One of the most modern weed control units in the west uses a basic principle taught by their grandmothers, "a stitch in time saves nine." A lonely weed killed this year saves a possible 7,000 to 50,000 weeds next year.

The big farmers in this country have long been doing a thorough job with selective sprays applied by large commercial outfits, but it was up to Mr. Mahoney, head of the County Agricultural Department, to see that specialized weed control was required if we were to prevent the spread of noxious weeds. With this thought in mind his department built up some light mobile equipment which is fast and economical to operate. An air cooled gas engine drives a gear pump which transfers the chemicals from a tank to the weeds. The county owns five pickups with 250-gallon tanks, one trailer outfit and three power wagons with 360-gallon tanks. The power wagons have endeared themselves to the crews that must work in muddy, sticky fields during the winter time. Yet these same vehicles are so fast and simple that they travel at ease with the pickups along the highway.

A city desk man might think the operators have swivel chair jobs when he sees a spray truck go by with the hose man sitting on a floating platform with a swivel seat. But this device makes it possible for the sprayer and driver to spot each passing weed and draw a bead on it without ever stopping the truck.

Considerable thought has been given to traffic safety while these spray outfits are operating along the highways. At first the trucks carried special caution signs, but the more the trucks were plastered up with signs the less attention the average driver paid to them. Now a single red blinking light does the trick. Each time a

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San Francisco, California, August 13, 1949

driver sees the red light he has visions of a cop and puts on his most courteous manners as he drives past.

The demand for this equipment is so great that all units operate on two shifts. The first crews start out at 4 in the morning and the second crews take over at 12 and operate until 8 at night. It is amazing the amount of ground these crews can cover. So far this year they have been twice over 1700 miles of country roads and 250 miles of state highways. They are now almost through with their third trip over them. They have covered a total of 35,000 miles and applied 90,000 gallons of spray. They have visited 1000 farms and treated 64 ranches.

The specific areas of attention for these spray outfits are county roads, state highways, railroad right-of-ways and small farms. A farmer can rent this equipment at any time. His only expense is for the chemicals and wages of one man. The County Department has found that the machine has greater educative value when the farmer himself rides in the swivel chair.

Killing weeds is a year-around job. This equipment runs steadily through the four seasons. The winter months are devoted to ground sterilization for the control of deep rooted perennials. The pests which come under this class are chiefly Johnson grass, Russian Knapweed, Perennial Pepper Cress, Hoary Cress, Klamath weed, Canada thistle and Bermuda grass.

Sodium chlorate and borax are the chemicals most often used. In the Spring, annuals get most of the attention such as Milk thistle, Yellow Star thistle and Puncture Vine. Dinitro oil spray seems to be the most effective and economical for them. Control of Yellow Star thistle and Puncture Vine continues through the summer with dinitro oil spray. Then in the fall the crews start on deep rooted perennials again and continue through the rainy season.

In order to make certain that no isolated weeds escape, the Agricultural Department has eight field men and 20 inspectors interviewing farmers and helping them identify weeds which are just becoming established.

Creep-Feeding Beef Calves

Condensed from The Southern Planter

Dr. J. E. Foster
University of Maryland

An increasing number of farmers in the South are marketing their cattle chiefly as weaned calves, believing that it is more profitable to keep larger cow herds to utilize the forage and other feeds on the farm rather than to hold over the calves. This has caused many breeders to ask how to produce heavier and fatter calves that will sell for higher prices at weaning time.

One method of doing this is by "creep-feeding." This consists of supplementing pasture and milk with grain and other concentrate feeds, fed from a bunk or a self-feeder enclosed in a small pen (with small openings) to which the calves, but not the cows, can gain access.

A satisfactory creep can be constructed economically from rough lumber or poles. A rectangular pen is usually constructed with a bunk or self-feeder in the center. The important thing is to have one or two openings on each side just large enough for the calves to enter, but too small for the cows to get through. The size of these openings may vary, depending on the size of the cows and calves. Dimensions of 3 feet high by 1½ feet wide are about right for most herds.

The size of the pens and grain bunks needed will depend somewhat on the number of calves to be fed. There should be ample space between the feed container and the surrounding pen to permit the calves to eat and lounge around without being crowded. Some cattlemen prefer to use the so-called "Monarca" type calf-creep which permits the calves to eat from narrow stalls small enough to prevent the cows from reaching the feed. No outside pen is required.

One of the most important items to consider about the creep is its location, for if the creep is not properly located the expected results may not be obtained. It should be located near shade and water. If the salt and mineral box is located nearby that will also help.

Many complex mixtures have been used for creep-feeding calves. Simple mixtures of two or more

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feeds have proved quite satisfactory. Both milk and pasture are relatively high in protein, so only a small amount of protein supplement is needed to balance the ration. A mixture of 8 parts of shelled corn and 1 part of cottonseed meal has given some of the best results in obtaining more rapid gains and higher condition. Even corn alone, if the cows were good milkers and the pasture tender, gave good results.

If the calves are being developed for the breeding herd oats and bran could be added to the ration. Or, if the price justifies it, barley and either soybean oil meal, linseed oil meal or peanut oil meal could be used to replace part or all of the corn and cottonseed meal.

A little extra care may be necessary in getting the calves started eating. They will usually start when about three weeks old and at that time a little ground feed may help in getting them started, but after that it is not usually necessary to grind the shelled corn. Keep the feed and container clean and remove any soiled or moldy feed.

According to findings of research workers, the chief advantages for creep feeding nursing calves can be summarized as follows:

1. Produces calves suitable for slaughter at a minimum expense for feed. It is well known that young animals, because of their lower maintenance requirements, require less feed per pound of gain in live weight than do older ones, and that their gains are thereafter cheaper.

2. Adds weight and finish to the calves, nearly 100 pounds heavier at weaning time. Under normal conditions those creep-fed will sell at a higher price per pound than those not creep-fed.

3. Helps to make the calves in the group more uniform in size. Calves from poor milking mothers tend to eat more than those from heavy milkers, and this evens up the gains.

4. Produces a product now in favorable demand among consumers.

5. Cattle are sold at a younger age bringing about a quicker turnover of capital.

6. Heifer calves should sell along with the steers without the discount that is always put upon older heifers.

7. Cows often maintain their weight better where their calves are creep-fed than where they are not.

8. Furnishes an outlet for grain in the form of cattle usually at higher than market prices for grain.

Creep-feed:

1. Calves to be sold at weaning time or after a comparatively short feed in the dry lot.

2. Purebred calves to be developed for breeding. The poorer the pasture and the lower the milk production of the cows the greater the advantage from creep-feeding.

Do Not Creep-Feed:

Calves to be marketed in late spring or summer after a long feeding period or calves to be wintered as stockers and grazed without gain the following summer.

The beef producer should study his conditions and then decide whether or not it would be advisable for him to creep-feed his calves. If the present price ratio of grain and choice beef continues it should prove profitable to creep-feed under many conditions.

Birds—First Line of Defense

Condensed from The Ohio Farmer

Melvin L. Hayes

MANY birds are better insect killers than a keg of powder. These hired hands keep working away for meager wages, saving farmers large sums of money each year. Besides waging war on six-legged pests, they destroy tons of weed seed and perform other commendable services. Farmers often forget the contribution of the bird race to agriculture.

Insects outnumber the rest of the animal world, according to entomologists. An average 10-acre meadow, it has been estimated, "houses" as many insects as there are people in the United States. These lowly creatures of the fields are not likely to get control, but still they can bring a lot of grief to rural dwellers. In fact, they cause United States farmers an annual loss said to approach a billion dollars.

The destruction would be much greater were it not for flocks of birds, nearly all of which are useful. A first line of defense against bug invasions, these stout-billed, sharp-eyed denizens (more than a thousand species and varieties in North America) rely on insects for more than half of their menus.

Being a migratory labor force, they are likely to go where picking is good. When small grain crops in one area once were threatened with destruction by wheat aphis or greenbugs, large migrations of goldfinch and sparrows mopped up the enemy. Birds also usually put in an appearance when rodents run riot. In 1907–

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Cleveland, Ohio, May 6, 1950

08, an estimated 900,000 field mice were destroyed monthly by hawks, owls and gulls in the plague-ridden Humboldt River region of Nevada. About a century ago, sea gulls saved the property—perhays the lives—of early Mormon pioneers in Salt Lake Valley in Utah by destroying hoards of invading crickets.

A few birds, however, are not too desirable. For instance, an inspection of the stomachs of 8000 English sparrows indicated 55 per cent of their diet was injurious to farms, consisting largely of chicken feed, grains and garden truck. They may harbor poultry parasites and diseases. Their unsightly nests, noisy chatter and unclean habits also help bring them into disrepute.

The cowbird is parasitic, laying its eggs in the nests of other species. Crows occasionally carry off chicks or eggs and eat some corn. Blackbirds destroy grain. Sharpshinned and Cooper's hawks are predatory. Blue jays are nest robbers and sometimes corn eaters.

To note some contributions of birds: When 855 blue birds were inspected, it was found that 68 per cent of their food had been insects and their allies. Insects composed about 98 per cent of the diet of wrens, a most beneficial little bird. Although about eight per cent of the food of robins may be cultivated fruits, it should be remembered that they are hard at work most of the year chasing injurious insects.

Phoebes, which like to be near farm buildings, destroy enormous numbers of insects, especially wasps. Another friendly fellow, the swallow, captures thousands of insects in the air or on tops of all grass and weeds. Meadowlarks go for grasshoppers, beetles, weevils and caterpillars in a big way. The Baltimore oriole not only has favorable food habits but gives out a sweet song, flashes its brilliant plumage and exhibits a most-interesting nest hung from the tip of a bough.

Many birds that winter in the North eat huge quantities of weed seeds. Several species of sparrows are valuable in this respect; quails score high, too. One authority estimated an average quail hen eats 60,000,000 weed seeds and 7,500,000 insects during her life time.

Some birds, such as the barn owl, help rid farms of rodents. Buzzards clean up from the countryside dead animals that might become nuisances.

Woodpeckers, gifted in getting insects out of trees, are valuable guardians of timberlands. Nuthatches, too, are adept in dislodging roomers in posts and trees.

In recent years, the law has become more and more on the side of the birds. Song birds cannot be killed legally at any time and game birds only during short sea-

sons. A treaty with Canada extends protection to birds that cross the boundary in migratory flights.

Positive encouragement as well as protection is needed. On some farms, berry-producing shrubs and seed-bearing weeds have been cleared away. Birds have no recourse but to by-pass these places or attack cultivated grain and fruit which have replaced their natural food supply. Hedges, bushes, trees and grassy stretches are welcomed by these feathered farmers. Wild fruits such as mulberries, elderberries, dogwood and black cherries might be grown in otherwise unusable spots. Multiflora rose grows into a fence six to eight feet high and six feet wide and will be a popular spot for birds and other wild life.

It would be worth while for all rural people to give a bit more attention to these tireless allies. A bird on the land is worth the farmer's protection.

Colonial Cow Versus Modern Cow

Condensed from Agricultural Situation

Benjamin H. Bennett
Bureau of Agricultural Economics, U.S.D.A.

If a colonial American farmer had done a "Rip Van Winkle" and had awakened this year he probably wouldn't be startled at the appearance of the present-day cow. In general, she would resemble the cow he was accustomed to milking, although she would probably be slightly larger and certainly better fed. But, if he milked an average cow of today, the results would no doubt cause his eyes to pop out.

Instead of the one-half gallon bucket that would hold all of the milk an average colonial cow produced in one day, he would need a pail that would hold slightly over 2 gallons. If he milked a cow in some of the present-day commercial herds, he would need at least a 4-gallon container. And if he milked Carnation Ormsby Madcap Fayne, a Holstein with a milking record of 41,943 pounds in 1 year, he would need a good-sized wash tub. After one such milking, no doubt he would have been ready to go back to sleep for another 200 years.

Although milk production per cow has increased sharply since colonial days, most of the gain has occurred in the last century. In 1850, production per cow averaged about 2,365 pounds per

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year. By 1890 it was up to 3,000 pounds. After 1890, introduction of the Babcock test, the expansion of the factory production of butter, cheese, and evaporated milk, particularly in the Middle West, and later the expanded market for milk for fluid consumption encouraged better dairy breeding and feeding practices. By 1909, milk production per cow had stepped up to 3,800 pounds, and in 1949, with the end not even in sight, it had risen to 5,239 pounds. This was 3½ times the milk given by the average colonial cow.

It is impossible to say which has had the most influence on raising milk production per cow —better breeding or better feeding. Purebred milk cows have been imported since 1795. In the last half century, improved breeding practices have been widely adopted. More recently, artificial insemination has helped raise the potential milk producing capacity of dairy cows. Increased knowledge of animal nutrition, better management practices, and heavy feeding of concentrates have made it possible to utilize that capacity.

Along with the increase in production per cow, the number of milk cows has moved steadily upward, despite cyclical "ups and downs." From 1850 to 1944, when the peak of 25,775,000 head was reached, the number of milk cows on American farms practically quadrupled. But population has increased at a faster rate and today one cow is supplying the milk requirements of almost twice as many people as in 1850.

Of the many changes in the dairy industry, particularly in recent years, probably the most significant have been in milk utilization. From colonial times until 1850, the dairy industry was built largely around milk production for home use. Any surplus went chiefly into home-made butter and cheese for sale to nearby neighbors or exchange at the local trading post, later the country store. In recent years, farm use, either for fluid consumption, feed for livestock or for farm-made butter, is taking an increasingly smaller proportion of the total milk production. The proportion used for commercially manufactured dairy products—such as butter, cheese, evaporated milk, dry milk, and ice cream is increasing slightly; while the proportion used for fluid milk and cream consumption has expanded sharply. These changes are leading farmers to market more of their milk as whole milk and less in the form of cream.

From a marketing standpoint, the changes of the past 25 years are perhaps the most significant of any in the industry's history. In 1924, milk production on farms and in towns totaled 93,-

660,000,000 pounds. Manufacture of dairy products took 41.9 percent; fluid milk and cream consumption in cities and villages, 29.9 percent; and the other 28.2 percent was used on the farm where produced. In 1949, milk production totaled 121,962,000,000 pounds. The production of manufactured dairy products used 45.2 percent of that production; fluid milk consumption 36.9 percent, and farm use 17.9 percent.

Although the proportion of milk production used for manufactured dairy products increased slightly between 1924 and 1949, the changes by products varied sharply. Products requiring both fat and nonfat solids of milk practically doubled. Skim milk products increased four times. But use of milk for butter dropped from almost one-third of the total production in 1924 to less than one-fourth in 1949. The milk equivalent of the creamery butter produced in 1949 was about three-fourths of a billion pounds less than in 1924. Butter is the only major product whose production requires less milk than in 1924.

Increased use of fluid milk and cream and products made from whole and skim milk has resulted from increased knowledge of their nutritional value. The emphasis on the need of increasing the consumption of milk and milk products for both protective and nutritional purposes began to bear fruit after World War I. Young people of today no longer switch from milk to other drinks early in their "teens," but are continuing to consume as much, and in some cases more, milk than they did while young. In most cases, they probably will continue to be heavy milk consumers after they are adults.

Per capita consumption of manufactured dairy products also is likely to reach new peaks in the years ahead. Some recovery is anticipated in the per capita consumption of butter, but whether it will ever again reach prewar levels, is a question that only the future can answer.

Enheptin Controls Blackhead

Condensed from Turkey World

Dr. Emanuel Waletzky

A PROMISING new weapon against blackhead disease, a new drug, Enheptin, is available in 1950. It not only protects birds before they become infected, but also saves them late in the course of infection, and is effective when mixed in the ration or the drinking water. Eight independent groups of investigators working with almost 10,000 turkeys have found Enheptin active in the control of blackhead. Although blackhead disease is all too familiar a story to many turkey growers, a short synopsis may help place our main characters.

Blackhead disease, accurately and more impressively called infectious enterohepatitis or histomoniasis, was first described in 1893. In 1895 Theobald Smith found that the infected ceca and livers swarmed with countless microscopic one-celled animals later named histomonads. This protozoan, generally considered the main villain, is greatly aided by a strange pair of accomplices, the chicken and the cecal worm. The chicken provides a breeding ground for the protozoan and the worm, usually without much danger to itself. The cecal worm egg provides a safe means of transport for the protozoan from bird to bird, and flock to flock. Although the droppings of diseased birds may be temporarily infective, the histomonads themselves soon succumb to cold, heat, or drying unless protected by the resistant shell of the cecal worm egg.

This tangled tale was finally unravelled in the early twenties by Theobald Smith, C. Curtice, H. W. Graybill, E. E. Tyzzer, and others. It suggested the practices which have made it possible to live with blackhead, namely: artificial incubation and brooding, with separation of poults from chickens and older turkeys; range rotation, wire platforms, and other sanitary measures.

Drug treatment, plus somewhat similar practices, have made possible striking advances in the control of poultry coccidiosis. Until recently no drugs were known which suppress histomonads, and which were reasonably cheap, safe, and easy to use. Enheptin fills this need and should make possible increased success in blackhead control.

The rapid progress from the

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laboratory discovery of Enheptin to its practical field application was made possible by the cooperative efforts of many research workers in industry and in the agricultural experiment stations of the United States and Canada. It is therefore fitting that this new chapter in the story of blackhead is also written cooperatively.

Enheptin is an offshoot of a large-scale search for better anticoccidials in the chemotherapy division of a large chemical company. Tests of some 2,000 compounds in over 20,000 chicks by biologists E. Waletzky and C. O. Hughes led to the discovery of a drug, for cecal and intestinal coccidiosis of the chicken, and about 17 other types of chemicals of lesser interest in coccidiosis. When tested in severe blackhead disease, only one of these 18 types was active. Chemists J. H. Clark and H. W. Marson speedily made numerous related compounds, one of which, Enheptin (2-amino-5-nitrothiazole), proved outstanding in activity and potential low cost.

Laboratory trials of Enheptin by E. Waletzky, A. Bliznick, and M. C. Brandt were severe and included more than 500 treated and several hundred untreated controls. The drug was active in diseased Broad Breasted Bronze, Beltsville Whites, White Holland and Jersey Buff poults. When diseased organs were inoculated rectally, about 90 percent of the untreated controls died some 12 days after inoculation. In 11 separate trials, some 200 birds given Enheptin (0.035 to 0.2 percent in the diet), for two or four weeks starting at inoculation, were completely protected during treatment and for more than one week afterwards. This indicated the efficacy of Enheptin for continuous prophylactic use before an outbreak.

Probable effectiveness during an outbreak was shown in six different trials with 250 birds whose treatment was not begun until two to six days after the inoculation of infected organs. Such delayed treatment for two or four weeks prevented deaths due to fatal blackhead relapses in about half the birds, and with longer treatments, in about 80 percent of the birds. Again the deaths which did occur were delayed for about a week after treatment was halted.

Many investigators consider the ingestion of blackhead-infected cecal worm eggs the main route of natural infection. Dr. S. Brackett and A. Bliznick found that most lots of cecal worm eggs from Connecticut chickens carried blackhead. Enheptin was more active in experimental infections produced with such eggs than with infected organs. In three separate trials, 16 out of 22 untreated poults died in about 17 days. Two weeks of treatment, be-

gun at inoculation or up to three days later, saved all 32 treated birds. Even when treatment was delayed from four to 13 days after inoculation no deaths occurred until more than a week after treatment stopped in 58 birds, and some birds were saved. (At 13 days the birds showed typical yellow droppings.)

The improved survival and the characteristic delay in mortality seen in this laboratory work, together with the effectiveness of treatment late in the infection, suggest that repeated "skip" treatments should be effective in natural outbreaks, if previously unexposed birds become infected or if relapses occur. In many flocks such treatment may prove more economical than continuous long-term prophylactic administration.

No serious toxicity was found in these experiments, as there was an adequate "margin of safety" between effective drug concentrations and those which only retarded growth slightly. Concentrations of 0.05 percent in the diet were fed for periods up to 19 weeks without killing birds or reducing weight gains significantly. Concentrations of 0.1 percent in the diet for twelve weeks retarded growth, but only killed some birds after seven to ten weeks, and normal growth was resumed in the survivors when treatment was stopped.

The preceding results were very encouraging, but the road from laboratory to farmer is strewn with the wrecks of such results. Skilled driving by two other divisions of the chemical company was essential. Chemists M. E. Hultquist, J. M. Smith, Jr., J. S. Webb, R. D. Vartanian, and W. Allen learned how to make freight carload rather than test tube amounts of Enheptin. They also prepared derivatives of Enheptin suitable for use in the drinking water as well as the feed. Pharmacologists R. W. Cunningham and B. K. Harned found that man could safely consume turkeys treated with Enheptin, since its toxicity in mammals is of low order. In one of many critical tests, dogs were fed cooked meat from turkeys previously fed 0.05 percent Enheptin in their diet for 20 weeks. Each day, for 27 days, the dogs ate enormous amounts of "treated" meat, equivalent to a daily consumption of seven pounds by a 140 pound man. In spite of this, no ill effects were observed, and the dogs gained weight. Veterinarians C. A. Bottorff and L. A. Kanegis of the laboratories then arranged for 22 laboratory and field trials by eight investigators, which included some 9,000 turkeys.

Preventive trials were conducted on eight cooperating farms by Drs. Jungherr and Winn of the Storrs (Connecticut) Sta-

tion. The experimental turkeys were divided at the age of 10 to 12 weeks into approximately equal groups, and maintained on adjoining sections of the range until marketing time. One group received mash medicated at the level of 0.05 percent of Enheptin, while the control group received the same mash without the drug. Most of the birds dying during the experimental period were submitted for laboratory examination.

On two farms which had a history of blackhead trouble over a period of years three chickens were added to each group to reinforce natural exposure. On one farm this procedure resulted in a loss from blackhead of 15.5 percent in 65 control birds, but none in the 65 medicated birds. On the other farm, of 100 control birds, 35 percent were lost, in contrast to 7 percent from 200 medicated birds.

On six farms the turkeys were reared on naturally contaminated ranges, but the over-all incidence of blackhead was very low in the summer of 1949. Significant losses occurred on only one of these farms, which lost 62.7 percent of 51 control birds, in comparison with 6 percent in the same number of medicated birds.

Therapeutic trials were conducted on three different premises, by giving 0.1 percent Enheptin-medicated mash for about two weeks. Visibly affected birds were put up in a hospital bunch, after blackhead losses had already become severe. Among 244 birds so treated, the losses averaged 22 percent, while any experienced turkey man would have expected a loss of nearly 100 percent. It was highly interesting to note the drop-off in daily mortality, usually beginning on the fourth day after medication was begun. Some of the treated birds were observed at slaughter several months later, and still showed minute liver lesions, indicating that they actually had blackhead and recovered.

So far, there is no certainty that blackhead-recovered birds, either with or without the help of drugs, became immune to the infection, quite unlike the situation in coccidiosis. On the other hand, field experiments on the control of blackhead with Enheptin were definitely promising, especially since no practical chemotherapeutic control had been available up to the present time.

Historically speaking, blackhead wiped out turkey raising from large areas of the United States. The industry was slowly brought back by an application of principles of sanitation, consisting of separating the birds from sources of contamination. However, this was only partially successful with range flocks. Losses from blackhead vary from

year to year, but some year's losses have reached very serious numbers, even under the best of range management.

With the discovery and application of drugs possessing a high degree of success in controlling coccidiosis in chickens, it was only natural to search along similar lines for a drug that would be successful against the costly blackhead organism. Such a drug, called Enheptin, was found and was used in a flock of 663 turkeys grown from June 23 to December 8, 1949, at the University of Delaware Substation, near Georgetown.

The flock was divided into three groups of 220 birds each and randomized in six one-acre plots. The chance of one group getting greater blackhead contamination than another was reduced by this procedure. Since blackhead losses in past flocks have been scattered from 13 to 22 weeks, a continuous feeding of the drug before, during, and after this period seemed most logical to succeed and was followed. Each dead bird was examined to determine the cause of death, and special attention was given to discover any evidence of blackhead.

No evidence of blackhead was found in the group that received one pound of Enheptin per ton of feed (0.05 percent). The group receiving one-half pound per ton (.025 percent) had a blackhead loss of 2.35 percent. The untreated group had a blackhead loss of 5.21 percent.

The drug had a beneficial effect on feed utilization. The group receiving one pound of drug per ton required 4.19 pounds of feed to produce a pound of turkey at 24 weeks of age. This compared to a feed requirement of 4.09 for the group receiving one-half pound of drug per ton and 4.33 pounds for the untreated control group.

The average weight of the birds appeared to be slightly reduced in proportion to the amount of drug fed. Those receiving the highest amount of drug averaged 15.98 pounds, those receiving one-half pound per ton averaged 16.08 pounds, and the untreated control group averaged 16.77 pounds.

It appears that blackhead, the dreaded turkey disease that has resisted all attempts at medication during its recognized 60 years existence, is at last yielding to drug treatment.

Four independent investigators have found that a new drug, Enheptin, is highly active in severe laboratory infections of turkeys with blackhead disease. Field trial results obtained by four other independent groups of investigators all confirm its value as a control measure during natural outbreaks of blackhead, and as a preventive measure before outbreaks occur.

Town-Country Communities

Condensed from Kansas Farmer

Dick Mann

CITY limits no longer separate interests of town and country people. That is the conclusion reached by Professor Paul Kochan, of Baker University, Baldwin, Kansas, who has directed his rural-sociology students in a series of practical community surveys since 1943.

"We must quit thinking of town and country as 2 separate things and think in terms of the new Town-Country community," says Professor Kochan. "Our surveys of the Baldwin community since 1943 have shown there has been a gradual breakdown of the barriers that once existed between town and country people and that Baldwin, like all small towns, merely is the center of interest for people in a much larger area. Once all the people in such an area understand this they can begin to work together for the common interests of all, instead of pulling and tugging against each other," Professor Kochan adds.

Through his studies, Professor Kochan has worked out a system with which any community can look itself over, determine its area of influence, and then act accordingly.

Here is the general method used to study the Baldwin Town-Country Community. Professor Kochan assigned his students to map the area of influence of each store, each doctor and dentist, the schools and churches in Baldwin, and then put these all together to make one master map. The work was done by personally interviewing town and rural people in the stores, on the streets, finding out where they lived, what interests they had in Baldwin, what they thought of the town, what improvements were needed to serve farmers better.

"Our first survey in 1943," says Professor Kochan, "showed that Baldwin already was a Town-Country community, but the people didn't know it. While they had a lot of common interests they were antagonistic toward one another. Farmers thought business men in Baldwin were not interested in them and that students at Baker University did not like farmers. Business men were antagonistic toward teachers at

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the university and thought the university folks were trying to run the town. In other words, our survey showed the community problem was mental as well as geographical." Results of the 1943 survey were presented to a local civic group, which showed interest but no one took the lead in correcting the situation.

"When we made our 1947 survey," says Professor Kochan, "we found the town's sphere of influence was practically the same, but that a great change in attitude had taken place on the part of farm people toward Baldwin. Farmers now felt that Baldwin merchants were trying to meet their needs and these efforts were appreciated. Merchants had become very conscious of farm trade and farm problems. A lot of new young merchants had taken over many of the businesses right after the war.

"Part of the improvement was due to organization by the merchants of a Commercial Club, which had been sponsoring a series of programs and projects to interest folks in the entire community. One of the most popular was a street dance held every 2 weeks during summer. These dances gave everybody—town and rural folks—a chance to mix socially and get better acquainted. Later, square dancing was held somewhere in the community every Saturday night.

"We also found," continues Professor Kochan, "that in 1947 merchants were just beginning to be conscious of the need for soil conservation. We found, too, that Baldwin needed a hardware store as an added service to farm residents. We now have a good one."

What are the services any community should have to meet the needs of its town-country residents? Here they are, as listed by Professor Kochan: banks, farm equipment dealers who carry repair parts for implements, elevator, produce market, clothing and food stores, drug stores, good high school, good churches, good theater and other public social affairs, good special-interest groups having both town and country members, a well-organized recreational program including the interests of the entire community, good roads within the entire community, a good telephone system, a good country newspaper, doctors and dentists, a school superintendent who sees the entire community problems rather than just the town problems, and ministers who have the same broad vision.

"In fact," says Professor Kochan, "church surveys have shown that ministers are key professional people. If churches do not enter into the general community program, they do not survive. Those that do, grow and prosper."

Results of the 1947 survey were presented to the Commercial Club and most activities of the club since then have been based on survey findings.

Now, let's get down to the 1949 survey, which was a real eye-opener. "We found that nearly all evidence of friction between town and country and town and university had disappeared," reports Professor Kochan, "and for the following reasons:

"Since 1947 President Nelson P. Horn, of the university, had succeeded in making all facilities of the college available to the entire community. The gymnasium was opened without charge for square dancing, the swimming pool was used by public-school children during the school term and by everybody in the community during the summer. The lighted athletic field was turned over to the high-school football and track events for less than actual expense costs. In these, and many other ways, the university had been demonstrating that it is part of the local community.

"It is no accident, either, that the attitude of students at the university has changed. When given a chance to come into close contact with farm people, students found they liked them very much. Farmers reported enthusiastically in 1949 that the students now were friendly."

One thing the 1949 survey brought out was that more local groups now contained both town and country members. The 2 Methodist churches in Baldwin both reported increased farm membership. The Ives Chapel Methodist Church found the percentage of farm members had increased from one fifth of the total to one half, while the First Methodist Church reported that where only 18 farm families belonged in 1947, there were 75 in 1949. Both churches had added special events of interest to farm families.

Jim Leitnaker, editor of the Baldwin Ledger, says he has changed his entire editorial outlook since the surveys were made public. He now runs more farm features on his front page, and recently added a complete farm page.

The Baldwin Commercial Club has become very farm-minded. The club has sponsored soil-conservation tours and plow-terracing demonstrations. Thru the Soil Conservation Service, the club obtained a complete soil map of the county and this is being used to educate both town and country residents on what the entire county soil problems are. "Farmers get a new slant on their soil problems when they see them in relation to the community's soil problems," says Professor Kochan.

After both the 1947 and 1949 surveys, Professor Kochan and

his class recommended formation of a Town-Country Community Council to study the needs of the entire community and to make plans for meeting those needs. This council now is a reality.

The council is made up of representatives of special groups, such as Grange chapters, home demonstration units, Farm Bureau, the Commercial Club, Rotary Club, American Legion and Auxiliary, Garden Club, Baker University, and neighborhood clubs. All members of the executive committee, however, are members-at-large. When elected to the executive committee, these members cease to represent their special groups, but work for the benefit of the entire community.

Two community-health recommendations are being considered as a result of the community surveys. One is a local health clinic for public-health education but, more specifically, to control flies, bugs and other pests that threaten health and comfort of the community. Second is a community-health center that would include offices for local doctors and dentists, facilities for emergency medical and surgical work, a few beds for obstetrical care, some laboratory facilities, offices for the health department, and quarters for clinics as needed.

These are only a few of the things the awakened Baldwin Town-Country Community plans to do. Is Baldwin any different than other Kansas communities? We asked Professor Kochan that question. "No," he replied. "Of course," he adds, "each community may have some problems that differ from others, but each Town-Country Community can be determined through studies and surveys and, once determined, all activities should be based on that Town-Country interest basis."

Virgil Reeves, Baldwin merchant and past president of the Baldwin Commercial Club, puts it this way: "We've got to stop thinking of town people and farm people as different. We are all just the same kind of folks, with common interests. Once we accept that fact and start working together, there is no limit to what we can do."

Time Savers in Dairy Chores

Condensed from Ohio Farm and Home Research

R. H. Baker and R. A. Bailey

EVERY farmer should be interested in performing necessary farm jobs with less effort. In most instances he is interested in getting the job done in the shortest time that is practical. He wants to accomplish this economy without reducing the quality of his product. He wants the job to be done with a maximum of safety. He wants the newer method to enable him to produce his products without any higher cost per unit and would prefer that it reduce the cost.

On many Ohio farms, 150 hours or more per year are spent caring for each dairy cow. A study of milk costs in 1946 revealed that the average time spent per dairy cow in Ohio each year was 128 hours. In a recent dairy chore study, one man was visited who had reduced his time spent per cow to 44 hours per year.

STEP SAVERS

Carts and Circular Travel

Using carts to carry feed to cows reduces the distance traveled in feeding to a fraction of that required when shovels or baskets are used.

For carts to be used successfully, curbs and other obstructions must be removed or bridged. Carts should hold enough feed for an entire feeding in order to minimize back tracking and reloading. They also must be small enough to pass through the aisles conveniently.

Cross and end-aisles reduce travel in feeding, milking, and other jobs. Circular travel is possible, as one can travel around the barn or around a group of cows without back tracking. With end-aisles and a cart it is possible to feed silage or grain to all the cows in a medium size barn in a single trip around the barn. Cross and end-aisles simplify the milking operation by enabling the operator to move conveniently from the feeding to the milking area. They are especially valuable during milking in the case of two-row, face-in barns as it is easy to get from one side to the other when carrying equipment or checking milkers.

Turning cows in and out of the barn, bedding stanchions, and many other jobs are simplified when isles permit direct access to all points in the barn.

Reprinted by permission from Ohio Farm and Home Research, Wooster, Ohio, September–October 1949

Arrangement of Jobs and Equipment

The order in which jobs are done and placement of equipment can reduce excess walking by making it possible to dovetail jobs together, or even to do more than one job at the same time. Here are examples. Milk cows in order as they stand in the line rather than irregularly unless the possibility of spreading infection can be reduced by skipping certain animals. Place the milker switch and supplies in a convenient spot. Locate brooms, forks, and shovels at the point where the job is started. It may be possible to sweep down the aisle behind the cows as they are being driven out of the barn. Or, rinse water could be carried back when returning from carrying a load of milk to the milk house and thus eliminate a trip.

Frequently it is desirable to set up two or more work areas around which the chores are organized. One area, near the feed room and silage chute, could provide space for feed and feeding supplies. Another could be at one point in the milkhouse where the milker is assembled, rinsed and taken down. A third area might be set up behind the cows for barn cleaning supplies.

While doors and gates are not usually considered as pieces of equipment, their location and types have an influence on how easily chores can be done. Usually a much-used route can be shortened or circular travel can be achieved by cutting a door or installing a gate in a fence. Doors should be self-closing so that they can be opened with a knee or cart without stopping, setting a load down, opening the door and then repeating the process in reverse.

Storage of Feed and Bedding

Another way in which labor can be saved is by taking a look at how feed and bedding are stored. Where can it be fed or used in the easiest way? Can gravity be used to get it to the cows? Can the cows come to the feed? Ground feed can be stored above the cows and spouted directly down into a grain cart. In some cases, particularly small milking parlors, grain may be spouted directly to the cows.

It is often difficult to change the location of hay and straw storage areas, but chutes or trap doors can be placed so that hay can be dropped as close as possible to the spot where it will be fed. Especially in the case of chopped hay and straw, it is desirable to have several chutes. They should be placed so the hay or straw will be distributed over the area where it is to be used. In pen barns, feed racks can be placed at the edge of a mow floor or under a chute where hay can be shoved or forked directly from mow to rack.

Face In or Face Out Arrangement?

A much-debated question regarding full stanchion barns is that of determining the better arrangement for two rows of stanchions: face in or face out? Results of a recent study of this type of barn show that of dairy chores done in and near the stable about 80 percent of the time is spent, and 75 percent of the walking, is done behind the cows. Since about four times as much work is done behind cows as in front, an arrangement in which the cows face out seems to be the most advantageous in the use of labor.

TIME SAVERS

Almost every suggestion given has had two purposes: (1) reducing distance traveled to do various jobs, and (2) reducing loads that have to be carried. There are also time savers to consider in simplifying dairy chores.

Rapid Milking

The task of milking is of major importance because of the large amount of skilled labor it requires at definite periods twice a day. In a recent study of dairy chores it was found that 50 percent of the total dairy chore time was spent in the milking process. The time spent in the milking process, not including the preparation and cleaning of the equipment, was 2 hours and 22 minutes for a herd of 20 cows. Milking machines were left on these cows an average of 5¾ minutes.

Operators tend to keep as many cows as they can milk conveniently. By introducing better milking practices, machine time and total milking time can be reduced considerably. A new rapid milking procedure has been adopted on many farms with success. The procedures are these: (1) massage the udder with hot water 1 minute before applying the milking machine; (2) use a strip cup and start flow of milk from each quarter; (3) remove the machine as soon as the cow has ceased giving down milk which is usually in 4 minutes or less; (4) strip the cows out with full hand squeezes or by machine stripping. (The latter is a process of manipulating the udder and pulling down on the teat cups just before removing the machine.)

By adopting rapid milking practices the total milking time can be reduced or the operator can milk more cows in the same time he now spends with his herd.

Selecting a shovel of the proper width to fit a gutter may reduce the number of trips to half or less. Wider brooms may greatly reduce the time to sweep the stable.

If silage is thrown directly into the silage cart it eliminates handling it again for at least the first load.

Long Pasture Season

More time is required to care for the herd during the barn feeding season than during the pasture season. It requires 12 percent less time to do the dairy chores when the cows are on pasture than in the barn. This also includes getting the cows to and from the pasture. By harvesting and feeding themselves the necessary forage, the cows make this saving possible.

If the pasture program on the farm is one that provides for a long and abundant pasture supply it shortens the barn feeding season. Thus the time spent per cow per year is reduced. Where good pasture management is practiced there is usually a heavier milk production which further reduces the labor input per unit of milk produced.

To have an automatic shut-off valve in a water tank may seem of minor importance. If it prevents bedding from getting wet, as well as eliminating many inspection trips, it can result in time saved.

Analyze the Job

It might be well for every dairyman to set aside some time to think through his dairy chores. If an improved method is to be developed it is necessary to analyze the job. Break it down into its elements. Question why each step is necessary. Ask how it should be done. Is there a better way? If so, develop plans for an improved method. Eliminate the unnecessary. Simplify the process if possible. Then try out the improved method.

In analyzing any phase of dairy chores don't overlook the steps getting ready to do the job and cleaning up after it. Also consider the travel in going to that job and on to the next job. Combine elements of tasks when possible. Rearrange work places if it makes the job easier.

A purpose of job analysis is to develop the easiest and most effective method and order of doing the necessary work. Another purpose is to find the most convenient and economical tools, equipment, and facilities needed to do the job most effectively. Once this is done on paper the improved work method is ready for testing and use.

"Shoulds" In Range Cattle Management

Condensed from The Shorthorn World

Joseph Muir
State College of Washington

PEOPLE in the livestock field are all interested in one main commodity—pounds of meat. To keep on producing pounds of good quality meat in ever increasing quantities, is a goal that offers a challenge to every rancher.

There is no practical limit to what American agriculture can produce. We are living in a world of mechanization and electrification, and the application of science has done wonders for agriculture.

In 1787 a farmer could do little more than feed himself and his family. It took nineteen farm people to support one other American. Today nineteen farm people support themselves, fifty-six other Americans and ten persons abroad. In the past fifty years the output per farm worker has increased by 250 percent.

The welfare of farm families no longer depends entirely upon their thrift, how long and how hard they work, nor upon such things as the virgin fertility of their soil or climatic conditions or markets. Today, the degree of success is influenced a great deal by how much they know, how well they keep up with technical advances, and how efficiently they apply what they know. This brings us to the question of what can be done to improve the management and operation of beef cattle ranches. I would like to outline a few "shoulds" in beef cattle ranch management.

Take time to plan and to think. Do plenty of thinking when developing a plan, then when it is time for action, stop thinking and go to work. We should be doing everything we can to improve the feeding and the production of feeds for beef cattle. 76 percent of our time is spent in producing feed for beef cattle or feeding it out to them. Beef men should be thinking about new ways of producing grass. The newest wrinkle in grass production in Washington is that of sprinkler irrigation and the fertilization of the land through the pipes. You should use recommended pasture mixtures. Stockmen are having wonderful luck with Ladino clover, White Dutch clover, Orchard grass, and

Reprinted by permission from The Shorthorn World,
Aurora, Illinois, February 10, 1950

Alta Fescue in many parts of Washington. In western Washington where it was thought that beef cattle weren't adapted, men like John McDonald of Ferndale and Herb Nelson of Tokeland have disproved that theory completely. McDonald has 350 acres of Ladino, Strawberry and Orchard grass pasture that has been carrying a cow to the acre plus harvesting 700 tons of hay. Herb Nelson has 700 acres of Lotus Major that is carrying 600 head of cattle. This land was reclaimed from the ocean by a two-mile dike and after drainage Lotus Major is doing the job of reclamation. Alan Rogers of Ellensburg has proven to the boys in the irrigated sections that over 600 pounds of beef can be raised to the acre on pastures irrigated with flood methods.

Ranchers should study carefully the new types of equipment, hay choppers, hay balers, spray machines, branding tables, calf dehorning tools, electric fences, loading chutes, feed racks and a multitude of other new equipment ideas that are now being used successfully. Bill Fancher of Tonasket puts up some 400 acres of alfalfa without touching the hay with a fork. It is cut with tractor mowers, chopped with field choppers, and blown into stacks and barns, reducing his labor per ton at hay harvest to a minimum.

The new spray machines on the market for flies, lice and grub control are remarkable outfits. Bob Picken of Okanogan County has a spray machine loaded on a jeep truck, operated from a power take off. With this machine Bob sprays weeds out on the range and sprays his cattle for lice, grubs and flies during the year. He is finding the machine is paying for itself the first year of operation.

Ranchers should watch their animals' health. Be ever alert for an outbreak of disease. Practice religiously such safeguards as calfhood Bangs and blackleg vaccinations. Watch for outbreaks of hemorrhagic septicemia, pink eye and mastitis. Ranchers should never let nutritional diseases appear. These are preventable. Vitamin A is a very important consideration. As long as ranchers keep green leafy alfalfa hay before their cattle they have no trouble. The feeding of bleached out cereal hays has brought some vitamin A deficiencies.

Ranchers should work out a health program in cooperation with their veterinarians. Veterinarians generally would rather help you keep your animals healthy than to doctor them after they get sick.

Ranchers should watch overhead costs. It is surprising how incidentals can add up and eat into yearly profits. We have had

some sad examples of newcomers in the ranching business putting out too great an outlay for equipment, buildings and fancy fences before the income from the herd was assured. Ranchers should study the markets and keep up with trends. Although it is impossible to guess the market right on the nose, a general study of market conditions will aid in the selling of your livestock.

Ranchers should be concerned always with range management. Reseeding should be going on in some form every year. Weed control is an important must. The matter of controlled burning in timbered areas may be a localized situation, but one that is becoming serious in many sections.

Ranchers should practice rotation and deferred grazing. They should develop as many fenced areas as possible for rotation of pastures and for the dividing of various classes of stock both on the farm and on the ranges. Ranchers should keep after water hole development. A cow shouldn't have to walk more than a half mile for a drink of water in any direction.

Ranchers should watch closely the management of their breeding herd. Bulls of top quality should be selected. Use one bull for each twenty-five cows on the ranges. The grazing in separate pastures of dry cows, heifers, and steers has proven profitable. Ranchers should practice a good insect control program. The newest chemicals that are proving popular in the control of flies and lice are DDT and BHC or Benzene Hexachloride. Rotenone is still the standard control chemical for grubs. Portable sprayers are proving more popular than dipping vats and small corrals 10 to 12 feet wide and 20 or 30 feet long are recommended for spraying of cattle. Cat walks across the top are recommended for spraying for grubs. Spray machines should develop 400 pounds pressure or more for grub control.

Ranchers should pay serious attention to their breeding program. Much improvement has been made through purebred breeders sales, shows and advertising. Bull grading programs in Washington have ferreted out over 300 head of grade C and D bulls and these have been replaced by grade A and B bulls. Last year 1500 bulls were graded in nineteen counties in Washington. In 1945 a big percentage of the bulls were in the C grade. In 1949 the big percentages were found in the A and B grades. Purebred breeders and commercial cattlemen should be interested in the new Record of Performance Beef Breeding program. This is a program that proves the ability of bulls to produce a fast rate of gain on their calves. The Record of Performance, a combination of the scales

and eye judgment, is in operation in several states. In Washington six Shorthorn, Angus, and Hereford breeders are in the Record of Performance program and one commercial cattleman.

Ranchers should have a pair of scales. They are a must for carrying on a Record of Performance and will pay their way many times at sale time, the weighing of hay, etc.

Ranchers should keep records. Even though we don't love it, the Income Tax Bureau has taught us one good lesson—that accurate records are a necessity.

Ranchers should provide the necessary minerals in supplemental feeding of beef cattle. The minerals most needed in Washington are potassium, iodine, sodium chloride and calcium and the feeding of stabilized iodized ground salt and bone meal will supply all five of these minerals. New ideas are coming along all the time. In Arizona now, they are feeding salt with cotton cake to regulate the amount of cotton cake eaten. In this way, they can leave tons of cake on the range and the cattle will only eat so much each day.

With all these shoulds, it is easy to tell what would happen when good quality beef cattle are put on improved fertilized pastures, given mineral supplements, sprayed with DDT, given a liberal winter ration, and rotated from pasture to pasture so gains are constant. It would mean a near 100 percent calf crop, around 200 pounds more weight per calf at weaning time, and uniform quality calves that would bring the highest possible market price.

Above everything else, stockmen should keep their integrity and self respect, study, listen to the other fellow, but use your own head and make up your mind about what you, yourself, want to do. This is the great American custom, let's keep it that way.

Feeding Brood Sows In Dry Lots

Condensed from The Hog Breeder

J. L. Krider
University of Illinois

CERTAIN rations containing commonly used feed ingredients have been tested with sows and gilts in dry lot during gestation and lactation and have been found inadequate nutritionally. These rations supplied sufficient protein, minerals, fat-soluble vitamins, energy, and water. It is worth while, therefore to consider those water-soluble vitamin carriers that have been tested and found to contain the unidentified supplementary factors as well as the known ones that are needed by sows. On the basis of the tests with brood sows and gilts Table 1 is given as an aid for formulating adequate dry lot rations. All vitamin supplements are expressed as a percentage of the total ration.

Table 1. Some Sources of Water-Soluble Vitamins Needed to Promote Optimum Performance of Brood Sows Fed Continuously in Dry Lot.

A. As supplements to "corn-soybean meal" rations:
   a. 10–15% alfalfa meal, high quality.
   b. 5% alfalfa meal, plus 10% dried corn distillers' solubles.
   c. 5% alfalfa meal plus 2%, 3%, 4% or 6% condensed sardine fish solubles.
   d. 5% alfalfa meal plus 2% menhaden fish solubles.
   e. 5% meat scraps plus 2% dried whey by-products with whey fermentation solubles.

B. As supplements to rations containing animal proteins (some rations have contained 2% dried menhaden fish meal as well as tankage, meat scraps, or meat and bone scraps):
   a. 10–12% alfalfa meal, high quality.
   b. 4% alfalfa meal plus 6% dried corn distillers' solubles.
   c. 6% or 12% dried corn distillers' solubles (not as satisfactory as a or b above).
   d. 5% alfalfa meal plus 1% condensed sardine fish solubles.

Reprinted by permission from The Hog Breeder, Chicago, Illinois, December 1949

e. 5% alfalfa meal plus 1% condensed sardine fish solubles plus 1% dried fermentation solubles.

Many feeders consider supplements from animal or fish sources to be essential in dry lot broodsow rations, chiefly because they contain high-quality protein and minerals. Results indicate that animal, milk and fish products such as those listed above have an added value because they contain essential vitamins. The vitamin content of such feeds may be responsible at least in part for nutritive values previously attached to similar products for dry lot feeding. These products contain variable but significant amounts of vitamin B-12 and possibly the other animal protein factor(s). Even so, our research shows that animal and/or marine by-products are not indispensable in rations, even during the nutritionally critical periods of gestation and lactation, if the vitamin needs are supplied by high-quality alfalfa meal, green pastures, a combination of distillers' solubles and alfalfa meal, or other plant ingredients that will supply the essential nutrients. If limited supplies of animal, milk or fish products are available, feed them to sows during pregnancy and lactation and to pigs up to 75 pounds in dry lot.

Much is being written about vitamin B-12 and the animal protein factor(s). Many good pig rations supplied these nutrients long before the discovery of vitamin B-12. Nutritionists now generally believe that there are at least two components of the animal protein factor. Although vitamin B-12 or APF concentrates will find a place in certain types of dry lot swine supplements or rations composed largely or entirely of plant ingredients, they are not likely to eliminate the use of animal, milk and marine by-products that have always been so popular in swine feeds. Furthermore, the addition of various concentrates of B-12 or APF to rations already adequate in these nutrients can hardly be expected to give super performance. In our research with 2-day old baby pigs, it has been necessary to feed a deficient diet plus a sulfa drug to prevent intestinal synthesis to produce a vitamin B-12 deficiency. The extent to which the pig can synthesize vitamin B-12 and to what extent practical rations might be deficient in it remain to be studied.

Green Pasture—A Valuable Water-soluble Vitamin Supplement for Brood Sows. Some gilts in dry lot were fed a basal ration of 67% yellow corn, 25% soybean meal, 5% dehydrated alfalfa meal, 2.5% minerals and 0.5% vitamin A and D oil during ges-

tation and lactation. Only 26% of the pigs farrowed lived to weaning age and they averaged only 17.1 pounds each. The pigs were emaciated, listless, and unthrifty, and had rough haircoats as well as wobbly unsteady gaits.

Two groups of similar gilts having access to fall seeded rye pasture weaned 74 and 79% of their pigs with average weaning weights of 32 and 30 pounds respectively.

The importance of adequate nutrition during gestation in promoting successful lactation and the value of green pasture (rye) as a vitamin supplement were clearly demonstrated. A group of dams had rye pasture plus the above basal ration during pregnancy but received only the basal ration in dry lot during lactation. Sows so fed weaned 90% of their pigs averaging 27 pounds each. This residual effect was probably due to a storage of a vitamin like factor(s) in the tissues of the sows while on green pasture. These reserves were then used during lactation, thus enabling the pigs to survive and perform more satisfactorily than those produced by sows fed the basal ration throughout. Although this work was with rye pasture, it is believed that any green succulent pasture would have a similar effect. Indeed green pastures help correct many vitamin deficiencies both for swine on pasture and for those removed from pasture to dry lot and fed borderline or nutritionally inadequate rations.

Maybe You Can Feed More Roughage to Your Lambs

Every lamb feeder is faced with two real questions: how to cut feed costs, and how to "push" his lambs without running into "over-eating" disease that comes from eating too many concentrates. Feeders at the Kansas Station have just come up with a couple of answers that might help:

They found that lambs gain almost the same, whether they get 55 pounds of concentrates for every 45 pounds of roughage, or the other way around—55 pounds of roughage for every 45 pounds of concentrate.

Not only is the ration with 55 pounds of roughage cheaper, but the lambs get more out of each dollar's worth of this mixture.

—Farm Journal

Driers Essential Farm Equipment

Condensed from The Farmer

Dr. H. J. Barre
Chief, Department of Agricultural Engineering

THE mechanical drying of crops is becoming one of the most useful developments on the farm. It offers many advantages and will be essential to successful farming in the future.

Much improvement has been made in soil management, seeding, tillage and harvesting equipment. But the storage and conditioning of crops after they are once harvested are still much the same as those used by our forefathers. In fact, the storage problem in many respects has been aggravated by mechanical and rapid methods of harvesting which often results in crops stored with too high a moisture content. Improved methods of conditioning and storing crops, irrespective of the harvesting methods used, have been long overdue. The 10 years ahead should see the adoption of mechanical drying on a wide scale and prove it to be the most useful new development in our agriculture.

During the past few years a sufficient number of crop driers have been used on farms to demonstrate the practicability of this type of equipment. Most of the farmers using this equipment were able to pay for it in one year in the drying of their corn, which was high in moisture content. The difference in market price of wet and dry corn within the past few years accounted for the increased income.

Mechanical drying should be used only when needed. It is not practical to use it for every crop every year, but, on the whole, one or more crops require drying every season. Such crops as corn or hay require drying in almost every season.

Farmers look to drying as a means of reducing the weather hazard. Corn can be harvested earlier when the weather is better for picking. Although the moisture content is high it can be picked as much as three weeks earlier than the regular picking time. Losses of ears blown from stalks in storms and strong winds are avoided. This is much more of a factor now when the corn borer is responsible for many of the fallen ears.

Similar advantages of harvest-

Reprinted by permission from The Farmer,
St. Paul, Minnesota, February 4, 1950

ing are claimed for the making of hay and the harvesting of oats. The period during which the hay is left exposed to the weather, especially during the first cutting, is greatly reduced. With reasonably good weather, hay can be cut one day and put up the following day. Oats can be harvested several days earlier and wind-rowing the oats can be eliminated by simple mechanical ventilation of the grain with unheated air.

One of the principal advantages of drying crops on the farm is the increased possibility of using newer methods of harvesting, handling and storing crops. For example, there are possibilities of using a "picker-sheller," because the high moisture shelled corn can be dried and stored satisfactorily in bins. Shelled corn can be handled with much simpler and more economical equipment. An example is the screw conveyor which is well suited for elevating the grain in and out of storage.

Hay can also be handled more simply and more economically. One of the principal disadvantages in the chopping of hay is the danger from spontaneous heating, especially when stored in large bulk as in hay mows and in stacks. This danger can be completely avoided by simple drying methods. Moreover, a building can be utilized to better advantage in which the hay is not only stored and dried, but there is also the possibility of self-feeding the hay out of storage.

Even if ear corn is to be stored, mechanical drying can also be used to reduce storage costs. For example, a building of the type used for the storage of machinery can readily be adapted for the storage of ear corn by supplying a large ventilating duct running the full length through the center of the building. The corn is dried by placing a heater at one end of the duct and by blowing heated air into the duct and out through the corn. The corn may either be left in storage or shelled and stored in bins if it is dried to a moisture content of 13 percent.

The adoption of mechanical drying on the farm will conserve much of the crop. It is difficult to estimate the amount of loss which occurs but there is evidence that these cannot be overlooked. For example, 95 percent of the corn grown in the corn belt is potentially number one grade, providing the moisture content is reduced to 14% or less. Yet the corn at the markets rarely grades No. 1 or even No. 2. Most of it is No. 3 grade or less. Although the reduction in grade is due to high moisture, much of it is due to damage in handling and storage.

Shrinkage of ear corn stored in conventional cribs over and above the loss of moisture has been ob-

served in tests conducted 10 years ago at the Iowa Agricultural Experiment Station. A loss in weight other than moisture of as much as 15 percent was observed when the corn was stored with an original moisture content of 25 percent in the kernels. This means that we may expect a loss of as much as 15 bushels out of every 100 bushels put in the crib, not to mention the losses due to the lowering of grade. When the corn was cribbed with a lower moisture content, the loss in dry weight was less, being as low as 2% when cribbed with a moisture content of 16 to 18% in the kernels.

A reduction in market value due to poor methods of storage has also been observed in the storage of other grains. The condition of "sick" wheat, which has resulted in a reduction of as much as 75 cents a bushel, can be avoided by the simple installation of a duct system or a false floor in existing bins and ventilating the wheat with a small fan with unheated air.

There are other uses for which mechanical drying equipment can be used on the farm. Some types of crop driers can be used for heating farm shops, poultry and hog houses, and other buildings in cold weather. Fans and blowers used for drying without heat can be used for ventilating such buildings as milk houses and dairy houses in warm weather. With drying equipment at the farmer's disposal he will use it for many purposes other than the drying of crops.

Once farmers are acquainted with the operation, uses and advantages of mechanical drying equipment, they will readily adopt this development. One of the more serious disadvantages is the fire hazard and the increased cost of insurance during the period of drying. However, better drying equipment is being made by the manufacturers and insurance underwriters' approval of certain types of driers has been obtained.

Advantages far outweigh disadvantages. Through such a method the farmers will have, for the first time, a positive way of handling grain and hay.

300 Bushel Corn—No Pipe Dream

Condensed from Farm Journal

Ray Anderson

SUNSHINE is the stuff that puts corn in the crib. We've never been so sure of that as we are at the moment. And a smaller corn plant, with fewer and harder-working leaves, spaced far enough apart so that hardly a leaf is shaded, may be the kind of corn more of us are going to be raising before long.

The 100 leading corn growers and corn scientists who attended the annual Corn Dinner in Chicago, March 2, agreed that:

"A yield of 300 bushels to the acre is no pipe dream, but before we get it we've got to have a corn that will capture and use more sun energy."

That annual corn meeting was sponsored by *Farm Journal* and the Schrock Fertilizer Company, who, together, have for three years been encouraging a number of adventurous souls to try to hit that 300-bushel mark. They've got within 80 bushels of it, and one day they will do it.

Let's take a little further look at this corn that lies ahead of us—and not too far ahead, either.

We began to get acutely aware of the importance of sun energy to corn in 1947. That was the first year of the 300-bushel adventure, when five good Corn Belt farmers, demonstrated that a "jungle" of corn plants just won't make much grain, no matter how much it's fertilized, and how much it's watered.

About that time, Robert M. Salter, chief of the USDA's Bureau of Plant Industry, put up a challenge to corn breeders. Salter said: "Why not breed high-yielding hybrids with fewer or smaller leaves that are more efficient?"

The challenge was repeated a year later by T. A. Kiesselbach, agronomist at the University of Nebraska.

A good many researchers have accepted Salter's and Kiesselbach's challenge. Several were already at work. I've just visited one whose experiments are so significant that I believe all corn growers would want to know about them. He is Dr. Edward H. Tyner. Since April 1, 1950, Tyner has been at the University of Illinois as professor of soil fertility. Previously he was an agronomist at the University of West Virginia.

In 1948, Tyner grew a corn that produced *three-fourths as much grain* (No. 2 shelled corn)

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as West Virginia B 17, a 100-bushel hybrid popular in that state. And it did it with *one-third as much plant.* In addition, it did it with *one-half as much plant food.*

In 1949, this corn produced only two-thirds as much grain as B 17, but again it did it with one-third as much plant and only one-half as much plant food.

The corn plants we are growing now take up and use about 2% of the sun's energy that hits them. The rest gets away. If we could get that sun energy intake up to 5% for all corn, as Tyner evidently has for his corn, a yield of 300 bushels might be commonplace.

There are other considerations than use of sun energy, of course. As we get into the realm of high corn yields, the soil, says Salter, "becomes more and more a medium through which nutrients are conveyed to the plant, and less and less the direct source of these nutrients." In other words, if you had harder-working plants you'd have to make sure they had enough materials—water, carbon dioxide, and soil minerals—to work on.

The supply of the sun's energy is limitless. The sunlight that we get free in these United States every year would cost 686 trillion dollars if it were metered to us at 1½ cents per kwh, according to Harlan True Stetson, director, Cosmic Terrestrial Research Laboratory, Needham, Mass. (His book *Sunspots in Action* has a chapter on The Solar Powerhouse.) What would be your share?

The fact is that *power unlimited* is *all around us for the taking,* if we just know how to harness it. Corn may point one way of using that sun—with more effectiveness than the atom bomb uses its "solar" power.

Tyner's sun-gathering corn came from northern Wisconsin, where the season is short—and where corn has to work hard. Called Wis. 335, it grows big and tall in the North, and is good for silage. But in West Virginia its stalks grow slender and no taller than 5½ to 6 feet.

The plants have only 10 leaves against a corn plant's usual 14 to 17 leaves. The largest leaves are only 2½ inches wide and 24 inches long. There's a lot better chance for the sun to get at those leaves.

One of Tyner's students, Newton M. Baughman, tried planting Wis. 335 thickly last year—at the rate of 30,000 plants to the acre—on his father's farm in Barbour County, W. Va. (Right alongside was a field planted to B 17, at the rate of 14,000 plants to the acre.)

Crows thinned the Wis. 335 stand to 25,000. There was no tangled jungle of corn, and very few stalks without ears. The plot yielded at the rate of 114 bushels

of No. 2 shelled corn per acre, against 100 bushels for the elder Baughman's B 17. The ears averaged 6.4 ounces at harvest, basis 15% moisture.

Baughman will experiment again this year, and Tyner plans to duplicate it in Illinois. Tyner will thick-plant several varieties for study of (1) how leaves use solar energy from the sun, and (2) the chemical composition of corn plants in relation to yield.

Tyner's work on efficiency in the uptake and utilization of nutrients by plants "is a field that has not even been touched by most corn breeders," says Salter.

As good a showing as it made, Wis. 335 isn't Tyner's favorite variety. The "ideal" type, he thinks, is the "short corn" (not dwarf) developed by Dr. W. Ralph Singleton of the Brookhaven National Laboratory, Upton, N. Y. But the trouble is that Singleton's corn has been hit by blight every year in West Virginia, and the yield cut as much as 48%. "When Dr. Singleton puts disease resistance into his 'short corn', look out for that 300 bushels to the acre," Tyner says. Singleton expects to get that disease resistance before long.

Leaf efficiency isn't the whole story. Tyner (like all corn researchers and good farmers) warns:

"Don't overlook *plant food balance* in the soil. Everything from *soil to sun* has to click for high yieds."

Here are some suggestions from scientists, and from corn growers who made high yields in *Farm Journal's* 300 bushel adventure:

1. Plant only *good ground* to corn. Rotate with forage legumes and grasses. If everybody did that we would build up the soil, and probably produce just as much total corn. In Illinois, for instance, nine out of every ten crop acres are in corn or other soil-depleting crops—only one in a sod legume. That's too much ground in corn.

2. Time your final seed bed preparation so that it will contribute the most toward weed and insect control, soil aeration and nitrification, and saving moisture as well as for covering the seed. How and when is determined by the experience of your locality.

3. Select the hybrid that does best where you live. But remember, some hybrids have more "oomph" than others.

4. Use a starter fertilizer when you plant. It will get your corn off to a good start, ahead of the weeds.

5. Base the thickness of your planting (hills or stalks per acre) on the estimated yielding capacity of the field in a favorable season. On land with an estimated yield greater than 60 bushels, plant the number of seeds indicated by dividing the estimated yield by 20.

That would be five, for example, on 100-bushel ground.

6. Time your planting for protection against the corn borer. Use insecticides if necessary. Iowa State College reports that "a large part of the stalk lodging and ear dropping last year was due to second brood corn borers."

7. Try to manage so you can plant in alternate rows with some other crop like soybeans. This will give the corn a maximum of sun energy, and boost the yield per plant. It has been known to increase yields as much as 20%. Soybean yields usually hold their own; may drop off 2 to 3 bushels per acre.

8. Test your soil for phosphorus and potash. You may need more than is supplied by a starter fertilizer. If so, get it into the soil before you plant. (Fertilizing the legume crop *ahead* of the corn is a dandy way to do it.)

9. Unless your corn is on a heavily manured field or follows a heavy stand of legume plowed under, it will need nitrogen during the growing season. Side-dress at the second or third cultivation.

10. Cultivate enough to kill the weeds. Don't prune the corn plant roots, but don't just scrape the surface, either. Nebraska tests indicate that mere scraping, as you might do with a garden hoe, makes less nitrate nitrogen (the kind plants can use) available. It usually pays to spray extremely weedy corn with 2, 4-D.

11. Pick corn for cribbing when the moisture is 17% to 20%. If it is too dry the ears knock off and shell excessively. If too wet, they won't keep.

To sum it up: Get a stand, keep the stand all season, and get it into the crib.

That isn't everything there is to growing corn, of course. But what do you think? Would attention to such suggestions boost the U. S. yield per acre by 70%?

Ben Courtwright of Logan County, Ill. would say "yes," emphatically. He knows, for he zoomed his yield from an average of 17 bushels an acre in 1945 (the county average that year was 51 bushels) to 101.1 bushels in 1949, an increase of 500%. And he had 285 acres in corn in 1949, too. He just used the know-how we already have.

Seven southern states have increased their average yield of corn by 50% in the last four years, just putting know-how to work. To quote Dr. Salter:

"Unless Midwest farmers adopt more effective measures, it is not inconceivable that future generations will look South when they speak of the great American Corn Belt."

When To Start A Breeding Herd

Condensed from The Hereford Journal

R. R. Snapp
University of Illinois

WHEN should you start a breeding herd? Tell me first when you should buy a car, a hay baler or a tractor? You probably would reply that you would buy these items of equipment whenever you thought you needed them to operate your farm more efficiently. In like manner, I answer the question which you have put to me: You should start a breeding herd whenever you need such a herd to operate your farm most advantageously. For a herd of beef cows should be regarded as a piece of equipment like a mowing machine, a hay baler or a manure spreader. As a matter of fact, it is all of these and a great deal more, for it may also be called corn picker, sweetclover harvester, and hay and straw converter without overplaying the imagination.

The decision to establish a breeding herd is not one to be made lightly.

Too often breeding cattle are bought like securities on the stock market or grain futures on the board of trade. In other words, one tries to wait and buy in at the low spot of the market just before prices start on a steep climb upward. When prices hit the peak you sell out completely or reduce your herd to a few old cows and sit around and wait for another low spot to arrive. When it comes you start building up your herd again in order to have lots of cattle to sell when peak prices return.

The "catch" to this method of operating is the difficulty of knowing just when the low and high prices will occur. But those who recommend this method have at hand a little device called "the beef cattle price cycle" which is supposed to give them this information in a nut shell. It is a wavy line drawn on cross section paper. The peaks of the lines show in what years cattle prices have been highest and the troughs of the line show when prices have been lowest for the period covered. Always the period immediately ahead is shown by a dotted line or is left completely blank because no one can say for certain what the future has in store. Still economists have much faith in the cattle

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cycle for they believe it indicates for how long a period prices will decline before they start back up —and when once they start up, how long they will continue to rise before they start back down again.

Such a system may be all right for buying something you expect to sell again like stocks and bonds or corn and wheat futures or even stocker cattle which are to be kept for a year or two before they are marketed. But it has little value for the farmer who is pondering the advisability of establishing a breeding herd. For a breeding herd is operative equipment, not a speculative commodity. A farmer either needs a breeding herd or he doesn't, just as he either needs or does not need a tractor, a hay baler or a feed grinder. If a man really needs one of these items of equipment he seldom postpones purchasing one for two or three years in the hope that prices will come down, for the fact that he thinks he needs one implies that he believes the savings the machine will effect over the years it will be used are substantially greater than its cost.

Likewise with a breeding herd. If a herd is really needed, it means that pasture, hay and other roughages now poorly utilized or perhaps going to waste would be converted into choice home-bred calves for the feedlot if a breeding herd were established. If all available feed supplies are now being utilized reasonably well by other livestock, a need for a breeding herd does not exist and none should be established. Hence, it is the available feed supplies rather than the level of the cattle market that should be given major consideration in deciding if or when a herd should be established.

But are not cattle prices too high to justify starting a new herd now? Should not I wait until prices are lower?

If you wait until you can buy cattle lower you are almost certain that the market will be still lower when you have cattle to sell. If you get in now when prices are high they may still be high when you sell your first crop of calves and not too low when you sell your second and third crops.

"Wait for lower prices" was the advice given by the economists to prospective cattle breeders during the period 1937-1940. Cattle numbers were much larger than they had been the previous decade, and a surplus of beef and lower prices of cattle were predicted with certainty by studying the beef cattle cycle. Those who followed the advice and waited are still waiting, for cattle are fully twice as high now as they were then.

Moreover, the original cost of a breeding herd is not a serious handicap, even with high prices, if you start with heifer calves. Most of the cost price of a 400-

pound heifer calf at 25 cents a pound, namely, $100, is likely to be recovered when you sell her as a mature cow weighing 1,100 pounds at 8 or 9 cents.

If you have feed that is going to waste you cannot afford to wait for lower prices, because each year you wait means the loss of a drove of 400-pound calves which may still be worth from $60 to $100 apiece in 1952 and 1953.

So my answer to the question, "when to buy a breeding herd" is THIS YEAR to the man who will have available feed supplies beginning this summer and fall; NEXT YEAR to the man whose pastures and meadows will not be ready until then! NOW to the man who has hay and straw in his barns and pastures already established and NEVER to the man who would have no feed for a breeding herd without changing a satisfactory livestock program.

India Can Feed Itself

Condensed from Foreign Agriculture

Henry W. Spielman
Agricultural Attache, American Embassy, Pakistan

MANY aspects of Indian life have combined to give credence to the widespread belief that India's farms can never produce enough food for all its people. The population is increasing by roughly 4 million a year, most of the good land is now being farmed, agricultural production methods and tools have changed but little over the centuries, and farmers resist change. Nevertheless, India's agricultural scientists believe that the nation can feed itself. In its agricultural experiment stations it has the knowledge, and on its farms it has resources that are not fully utilized. In those areas where the two potentials have been brought together, farm productivity has been increased by 60 percent to as much as 400 percent. And a 10-percent increase is all that India needs to become self-sufficient.

The system of agricultural experiment stations throughout India has been in operation for a number of years. Many of the

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stations are staffed with specialists trained in the United States or Europe and all of the stations have been highly successful. They have developed new crop varieties, improved plowing and cultural practices, developed water- and soil-conservation services and drainage programs, and introduced irrigation farming and land reclamation.

Station experiments have shown that by using improved varieties, farmers can increase yields by an average of 12 percent. If they also use manures and commercial fertilizers, they can increase them 25 to 75 percent. And if, in addition, they use slightly improved indigenous farm implements, space crops in accordance with rainfall and soil conditions, and plant and cultivate at the proper time, they can increase output 20 to 50 percent more. When all improved methods were used on one plot of an Indian farm, production was increased by 400 percent.

The Sholapur experiment station in the Deccan area of India reports an interesting example in its cooperative arrangement with a farmer on a dry hillside nearby. The farmer agreed to follow the station's recommendations in his 15-acre grain sorghum field, from which he had been getting an average yield of 150 pounds an acre. He was to use his own equipment.

His first step was to terrace the field to conserve both the soil and the moisture. Next, he prepared it for contour planting. Then he planted seed of the improved variety furnished by the station and spaced both the rows and the plants in the rows as recommended. Compost and chemical fertilizers were applied. When the crop was harvested, the farmer was amazed at the yield—660 pounds an acre.

The director of the station is convinced that similar results could be obtained by most farmers in the Deccan area.

India's agricultural scientists, have the know-how for solving the country's food problems. The question remains how to bridge the gap between the experiment station and the farmer. The answer, of course, lies in extension services. These, too, India has, but thus far they have reached few farmers.

Extension services are probably best developed in Bombay Province, where there is an agricultural agent and 3 or 4 assistant agents in each of the 19 districts. Each assistant supervises 3 to 5 village workers, who live with the farmers and pass along the latest recommendations of the Department of Agriculture. Because of the limited number of extension workers, only a small percentage of Bombay's farmers can be reached. Those who are getting

up-to-date farming information and learning to use it are getting increased yields well above those of their nonparticipating neighbors. Undoubtedly production of all types of food grains could be increased in a few years if there were enough trained extension workers.

Although India's farmers tend to cling to the traditional ways, Indian agriculture is not so static as it might appear to a casual observer. Changes are taking place. For example, 10 years ago, farmers of the Gujerat district of Bombay Province were raising their own bullocks. Now they get them from commercial cattle raisers because farmers realize that, with young bullocks requiring 4 years of costly care and training before they can be of use, it is cheaper to buy them already trained. Another example is to be found in the region around Anand, also in Bombay Province. Ten years ago, this area was producing only enough milk for local consumption. Last year, even in the February-March off season, the region sent 57,00 pounds of milk daily to the Bombay city market.

All this evidence of progress and change indicates that India is moving toward a modernized agriculture and a solution to its food problem. It will not be an easy or quick solution, however. India has 340 million people to feed, and the population increases by about 4 million a year. According to Indian food authorities, at least half the population gets less than 1,200 calories of grain a day. This diet, however, is supplemented by other foods. Indians eat some sugar in the form of *gur* (cane juice, boiled down until it forms crystals; *gur* is generally sold in blocks of 2 to 40 pounds). In addition, they have chillies, potatoes, pulses, clabber, nuts, and, in some areas, cabbage, eggplant, or cauliflower. Only about 25 percent of the people eat meat, generally mutton, fowl, or fish. It seems safe to assume that nearly all Indians have at least the subsistence diet of 1,800 calories a day.

In India as a whole, food grains probably represent 60 to 75 percent of the diet. In some areas they make up to 90 percent and in others about 45. Other sources of food are merely supplementary. The Government would find it difficult to change eating habits. Therefore most of the increased production will have to be in food grains. When the rationing system was most strict in India, there was a large black market in food grains. It grew out of the strong preferences that various groups have for specific grains. For example, when the ration was composed of, say, 40 percent wheat, 40 percent rice, and 20 percent other grains, those who preferred

rice would sell their other grains and buy rice.

Another custom that affects the general productivity of Indian farms is that of maintaining thousands of unproductive cattle on them. India has one-third of the world's cattle, but nearly a third of these either do not bear young or are unfit for work. Nevertheless, most Indian farmers will not part with their cattle. They have a religious objection to slaughtering unproductive animals and regularly make efforts to preserve all of the cattle. The Bombay Legislature recently passed a law prohibiting the slaughter of cattle under 15 years of age.

The fragmentation of Indian farms too has some effect on agricultural efficiency and therefore on the country's ability to feed itself. Few farms are a single unit. The farmer with 5 acres may have 5 different plots of land scattered over 2 square miles. He spends considerable time and animal power moving from one plot to another. Some of the Provinces have passed legislation to correct this waste. Bombay Province, for example, has fixed 5 acres as the minimum size of a plot. This law also provides that when a holder sells his land, if it is smaller than that minimum and his neighbors also have less than the fixed minimum, he must sell to one of his neighbors.

Indian farms vary in size with the kind of principal grain they produce. The average rice farm in Bombay Province is 5 acres, while most jowar-grain sorghum farms consist of 30. Of course, in many places rice farms may be only 2 or 3 acres or, sometimes only 1. Generally a family farm is the size that an able-bodied man with a grown son and two pairs of oxen can farm. Indian agricultural specialists believe that with the present type of farm power, this small unit is the most economic.

A trend that is disturbing Government officials is the migration of the more aggressive and enterprising young rural people to cities. One official cited this movement as the major reason for improving living conditions on farms and in villages. He stated that farming must be made as attractive as urban life, from both economic and sociological standpoints, if the better people are to remain on the land. It will be the more aggressive and enlightened farmers who will use the results of research and lead their neighbors to increased food production.

Perhaps the most important factor that makes it difficult for India to feed itself is the psychological attitude of the farmer. He will not change his ways readily. His reluctance is understandable. Indians have been farming their land for centuries. Through trial and error they think they have found ways to feed themselves de-

spite floods and droughts. Their methods have been in use for generations and consequently they question change. Even in the most backward areas, however, farmers are responding to new and improved methods when such methods are effectively demonstrated.

Many of the aspects of Indian life that stand in the way of a highly efficient agriculture are rooted deep in religious beliefs and in tradition, and the Government will not find them easy to change. But increasing production to a level of self-sufficiency would not necessarily require radical change in the social or economic conditions of the farmer. It calls only for making better use of his resources. India's food deficit is only 10 percent of total production. If the improved methods can be used on 50 percent of the farms, the country could feed itself. The other problems will eventually have to be faced and solutions found before agriculture can be on a continuously sound basis. And this can be achieved by extension services that can effectively get the results of research from the experiment station to the farm.

Good Farmers Make Good Soils

"Somehow the notion gets around," says Dr. Charles E. Kellogg of the U. S. Department of Agriculture, "that originally our farm soils were highly productive, that is, productive when first plowed. Many of them were like the black lands in our Middle West and in central Eurasia, for example, and in some of the great deltas and alluvial valleys. But most soils are not. It is through liming and fertilization, drainage, irrigation, the introduction of legumes, and a host of other practices, that farmers have made their soils productive," explains Dr. Kellogg who is Chief of the Division of Soil Survey in the Bureau of Plant Industry, Soils and Agricultural Engineering.

"After all," he continues, "this is the important thing; not the productivity when first plowed; but the response of soils to management systems. There is no more reason for saying that large areas in the tropics are without an agricultural future than there is for saying that large areas in the eastern United States and Western Europe are without an agricultural future, simply because one gets low yields in the absence of management practices that depend upon science and industry. Science and industry are within man's control."

—Better Crops With Plant Food

Poultry Manure For The Garden

Condensed from New England Homestead

J. R. Hepler
University of New Hampshire

MARKET gardeners have recognized the value of manure for a long time, especially that of horse manure, which is fairly high in nitrogen. Cow manure, with its low nitrogen content, does not become available until mid-summer.

When Boston did its hauling with horses and had a horse population of about 200,000, there was a lot of available manure for the market gardens of the suburbs. The passing of this supply of manure has not hampered the gardens too much because other materials have been used, especially green cover crops and poultry manure. The latter is probably the best available source of organic matter we have at the present time, and since it lends itself very readily to easy hauling and distribution, we can haul it 10 or 15 miles profitably.

Amounts of manure from hens in a year have been estimated at 60 pounds per hen by a New Hampshire agronomist, and as high as 136 pounds per hen in a test at the Pennsylvania State College. The former figure is probably closer to what you get over the country as a whole because hen manure is not stored well enough to keep it from disintegrating. But, even at 60 pounds per hen, New Hampshire's 3,000,000 hens will produce 100,000 tons of manure, to which should be added the manure from the broilers, which would add another 25,000 tons or so.

This particular by-product has always been a nuisance to the poultry farmer. He would haul it out on a river bank, hoping that the first freshet would wash it away, or he would haul it on a neighbor's land, or else he would pile it outside of his buildings somewhere and let whoever wished to use it help themselves. I have a feeling that at least half to two-thirds of the chicken manure made in New Hampshire during and before the war period was wasted. However, today people have a much better knowledge of the fertilizing values of this material and I am told that very little of it goes to waste.

The handling of the manure is a little different from what it used

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to be. The poultry people do not particularly care to have the gardener clean out their chicken coops because of the danger of introducing disease. The poultryman usually cleans out his own pens and has the farmer pick it up. If the pile is large enough, the larger gardeners use their manure loaders and haul it on a pile in their own fields and then load it onto their manure spreader and usually open it wide, putting on from 12 to 15 tons per acre.

Poultry manure should be put on the land some time ahead of planting, since it may burn. Then it may either be plowed under or disked thoroughly into the soil.

The value of chicken manure itself ranges from $10 to $20 per cord, depending upon how the manure has been kept. The use of shavings and sawdust in the scratch pens is probably not at all detrimental to its use as manure because the shavings, especially, are so broken up by spring when the manure is taken out of the pens that they are not recognizable. Probably shavings are, all told, about as good a material to use as the gardener can expect.

The use of superphosphate would help considerably with hen manure the same as with cow manure, and perhaps even more so. Hen manure is low in phosphorus and the addition of 750 or 1,000 pounds per acre, or from 50 to 100 pounds per ton, depending upon what you grow, put on the spreader with the manure is advisable.

In 1944, the Agronomy Department of the University of New Hampshire, wishing to find out the actual plant food content of poultry litter handled in different ways, had analyses made. The values of manure were calculated on a basis of 12c a pound for nitrogen, 6c for phosphoric acid and 3 8/10c per pound for potash.

Today these values are at least one-third higher so that 30% should be added to the value of the manure. Poultry litter with shavings piled in a shed for six months weighed 3,546 pounds per cord and had a value of $9.60 per cord. When the poultry litter was piled in the open it absorbed a lot more water and weighed 6,528 pounds per cord and was worth $11.26. A litter with sawdust piled but protected from rain weighed 2,560 pounds per cord and was worth $13.72. When it was exposed for six months it weighed 6,144 pounds per cord and was worth $11.27. Poultry litter with chopped straw and protected weighed 3,840 pounds per cord and was worth $12.56. When exposed it weighed 6,272 pounds and was worth $15.74 a cord.

Poultry litter with shavings, when sampled upon removal, weighed 3,328 pounds per cord and was worth $12.10. When exposed it weighed 5,120 pounds

and was worth $9.65 a cord. In many cases the difference lay in loss of nitrogen upon exposure. The addition of superphosphate to the manure as it is made helps to hold the nitrogen.

On inquiring among gardeners I find that most of them get the manure for nothing or else pay a price of around $5.00 a cord, or less, for it. It costs more to haul a ton of fertilizing value in hen manure then it does in commercial fertilizer because commercial fertilizer is more concentrated, but everything considered, hen manure is one of the best and most satisfactory forms of fertilizer for the garden.

Dried manures are not popular. It seems that the dehydrating process takes some valuable ingredient out of the manure. Perhaps the value of the manure does not lie entirely with its nitrogen, phosphorus and potash content. Certainly many of the rare elements often left out of high grade commercial fertilizer such as manganese, boron, zinc, copper and others are found in hen manure. In addition, there may be vitamins or hormones in manure which are valuable to plants.

Do not blame manure for your weedy gardens. Garden weeds such as rag weed, pig weed, lambs quarters, chick weed and other annuals are never found in poultry manure unless the manure is piled outdoors and the weeds grow on the edge of the pile.

Fill The Silo With Your "Poor" Corn

Fill the silo with your "poor" corn. Tests at the Ohio Experiment Station show that the feeding value of corn silage is not determined by the amount of grain in the silage—provided you put the entire plant in the silo. If the plant does not throw an ear the feed value is stored up in the stalk. Silage made from stalks after the ears have been removed is worth about one-third less (ton for ton) than silage made from the entire plant. A corn crop usually makes nearly one-half more beef per acre when made into silage than when handled in any other way.

How Much Can Cows Stand?

Condensed from Missouri Ruralist

Cordell Tindall

You will find that Dr. Samuel Brody, of the dairy department of the University of Missouri, combines a searching scientific mind with a keen sense of humor. Recently, we heard one of his famous talks to a group of dairymen at Columbia, concerning preliminary work with the climatic laboratory at the University.

The climatic laboratory started operations about 2 years ago. It is a small, air-conditioned barn in which dairy cows spend practically all their time under controlled temperatures. First a series of studies was made of cows under high temperatures. Then colder temperatures were used, but all results from later tests have not been tabulated.

First of all Doctor Brody wonders why we build barns for cows. Our domestic cattle are from cold climates and they seem able to stand a lot more cold than they do heat. Of course, barns are for sheltering owners and feed as well as cows.

Larger cows suffer most from heat, suffer less from cold. This helps explain why we have big Holsteins in Wisconsin, little Jerseys in the Ozarks.

In hot weather cows can't give off heat—and that makes them hotter. Eating also makes a cow hotter. Since she knows when she gets hot that if she eats a lot she will get still hotter, she just doesn't eat as much. Down goes production. Man also eats less in hot weather.

Dairy cows usually hit their peak production in early July. We give credit to the lush grass, but is climate more of a factor?

When temperatures in the laboratory were constant at 100° F., the cows production dropped to 8 per cent of their normal production. The larger Holsteins were first to go down.

When we study Nature we find animals are adapted to their natural region. Our domestic dairy breeds are cold-weather cows but there are hot-weather cows such as the Brahmas. These Indian cows have "radiators" in their giant, flapping, loose dewlaps. And all the fat in a Brahma is in the hump on the back so the cow is not covered all over with a layer of hot fat.

The Karakul sheep with the big tail also is a hot-weather animal. Fat is stored up in the tail.

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The Brahma has another hot-weather feature—it has a black skin but the hair is white to reflect heat.

"Should we paint our cows white in summer?" asks Doctor Brody.

One experiment at the laboratory was to measure temperature of hair and skin. When the temperature was 100 degrees the hair and skin were the same temperature. When the temperature was 50 degrees the hair was much cooler and the skin warmer.

It was interesting to note cows brought up from Texas with Brahma blood maintained their production when temperatures were raised. However, their production was not very much to begin with.

Our cows began to lose weight when the temperature hit 80 degrees. The Texas cows, on the contrary, shivered when the temperature hit 50 degrees.

One Jersey cow maintained her production much longer than others under high temperatures. She drank 3 times as much water as the others. She seemed to be more comfortable as the other cows were panting from the heat. It was noted the rate of urination was higher with this cow. Was this because she drank more water or did this cause her to drink more water? That's a tough question to answer, and leads to the question of "how can we get cows to drink more water when it gets hot?" Should we give them a kidney stimulant?

It also was noted that cows that were with calf all aborted when the temperature hit 100 degrees. We must remember in this laboratory the temperature is constant and that at 100 degrees it was this temperature day and night.

Cows couldn't stand temperatures of a constant 109 degrees. It was evident that they were going to die and as cows cost money temperatures were lowered.

When the temperature went up it was noted the pulse rate of the cows went down—while man's pulse rate goes up when he gets hot. The difference is that man can sweat more than a cow. The cow sweats very little for her size —man can sweat about 4 pounds in an hour, while the much larger cow can sweat only 2 pounds in an hour.

The only thing the cow can do to cool off is stick out her tongue and blow over it. Rats lick themselves, pigs get in the wallow and the mule sweats, but the cow just pants.

Doctor Brody casts a highly critical eye at the practice of using fans to cool off cows. We've all seen big fans blowing in show-barns. Do they do any good? At least they cool the owners. But the cow doesn't sweat so can blowing air over her skin cool her?

Cannibalism Can Be Controlled

Condensed from Everybodys Poultry Magazine

Thomas E. Moncrief

If you have never had any serious trouble with cannibalism in your flock you are indeed fortunate, for this vice can quickly become a vicious habit, hard to break and extremely costly.

Cannibalism is not confined to baby chicks or growing birds, nor to chickens. It occurs frequently with pheasants and other game birds reared in captivity, as well as in flocks of turkeys and even ducks. Once blood has been drawn from a bird and tasted, its pen mates really see red and will not stop until they have eaten the victim right down to the bone. I have disposed of many a skeleton, all there was left after the tormentors finished with their victim.

Sometimes no actual mortality from cannibalism results. An increased number of bare-backs and blue-backed birds in the case of colored turkeys, causing depreciation at marketing time, may be the biggest loss. On the other hand, mortality up to 40 percent has been reported in some instances and practically everything the operator tried was of little help. Those who have gone through an epidemic know what a headache it can be.

In baby chicks, toe-picking is the first symptom. It seems that as soon as chicks break out of the shell they like to pick at each other's toes. Woe be the chick which rips the nail from its toe or injures itself so that blood appears, unless it can be "saved" by its owner before the other chicks see the blood and start their merciless chasing and picking.

Next comes feather-pulling. The soft quills filled with blood, which appear at two or three weeks of age, seem to be especially tempting. The bad part of this is that the birds don't forget it once they have the taste of blood, and thus an outbreak may occur at almost any time.

Another bad feature is that cannibalism can be caused by so many different things. There is some indication that there may be a genetic factor causing cannibalism. Breed and strain differences apparently exist. Also, nutrition is involved. The breeder ration, as well as the feed being eaten by their off-spring, may contribute to cannibalism. Temperature also is involved, for generally more cannibalism occurs during

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warm weather, or when the birds are hot, than when it is cool. Most important factor of all, however, is management, and when cannibalism does show up, the operator had better take a quick inventory of what he is doing—or is not doing. Overcrowding probably comes number one on the list. The answer to this simply is to allow more floor space. In some cases, getting the birds out on a good sod has been the only solution.

Limited eating and drinking space increases crowding around fountains and feeders and often leads to picking. There are few poultrymen who actually allow more feeding space than the birds need. The opposite is usually true, even though it has definitely been proven that feed efficiency is better and greater production of both meat and eggs is obtained when there is ample hopper space.

Allowing water fountains to become empty is really opening the door for trouble. Thirsty birds are nervous birds.

Excessive heat can cause cannibalism. Many more chicks are damaged by too much heat than by not enough. With cooler brooding quarters, feathers develop better. Better feathers usually mean less cannibalism.

Insufficient ventilation, which results in a hot, stuffy brooder house is almost sure to result in this trouble. Not enough exercise or activity also may be the root of this vice, and this can be corrected by allowing the birds to run on a sunporch or on a good range. In fact, getting the birds out on range usually stops cannibalism because it eliminates so many factors causing this trouble.

Irregularity in care and attention might easily start your birds on the road to picking. If you fail to show up at your regular time or neglect them in one of many ways, the birds become restless and nervous. For want of something better to do, they resort to picking and pulling feathers. The poorest bird in the flock is not always the subject of their evil intentions, either. Failing to let the birds out of their range shelters early enough on a hot summer day is an excellent way to bring on disaster.

Many poultrymen believe that oats are not only a body-building food, but help prevent cannibalism and keep oats in front of their birds continuously after four weeks of age.

Scattering grain in the litter, rather than making it more easily available in hoppers also has the advantage of keeping the birds occupied that much longer, giving them more exercise and stirring up the litter where they might pick up some other vitamins that apparently are good for body development.

When the pullets are just brought in from range, and when

they are just starting to lay, cannibalism is a frequent occurrence. The pullets may lay on the floor because they haven't yet found the nests. Their penmates, coming along at the opportune time and seeing the protruding red flesh of the oviduct, grab hold. It's only a matter of time until those birds are bloody victims of their tormentors. Some poultrymen suffer serious losses at this time. It's a good idea to be on hand as much as possible at such times, and remove from the flock any birds which might have protruding oviducts at this stage of production. Supplying plenty of darkened nests and providing feeders that are either right on the floor or sufficiently high so that the vents of the birds feeding are out of reach of the birds on the floor, will help.

There are good anti-pick salves and solutions on the market which will help to heal injured birds, but preventing cannibalism entirely is much more effective than any treatment.

One of the surest means of controlling cannibalism is to trim the beaks. Before a machine was devised for this job, poultrymen would peel off the extreme part of the upper bill down to the "quick." This would prevent picking until the beak grew out again. A machine which now does this job removes about half of the upper beak by means of a heated knife or iron which cauterizes the tissue and thus prevents bleeding. It usually takes at least six months for this part of the beak to grow back. This has proved particularly effective. Some poultrymen have found that it is helpful to feed grain in troughs a few days before the debeaking in order to accustom the birds to such troughs.

Debilling day-old chicks is also increasing in popularity. The upper beak is removed by cutting with a toe-nail clipper. The amputation is made just in front of the chick's nostrils, well into the "quick" or beak forming tissues. Generally, little blood is shed. This not only prevents feather-pulling and picking, but tends to quiet the birds and reduces fighting.

Cannibalism is just one of those things which teach poultrymen that they can't be too complacent in this business. It is a most complex problem, and it's not always a simple matter to put your finger on the exact cause of the trouble. No poultryman can afford to say, "It can't happen here!"

More Milk From Pastures

Condensed from The Kentucky Farmer

Good pastures and good pasture management are essential for the successful operation of a long range dairy program. Pasture crops not only furnish essential and nutritious feed for the dairy herd, but they play an important role in conserving and improving the fertility of the soil.

Productive pastures as a rule are a cheaper source of the nutrients needed for milk production than any other crop, largely because the cost of establishing the pasture is spread over a period of years and the grazing animals reduce the labor and cost of harvesting.

The economic advantage of pastures over other crops is in itself an excellent reason for doing everything possible to improve their productivity and to manage them so as to get the greatest benefits from them.

The objective of a planned pasture program should be to provide adequate and nutritious grazing throughout as much of the year as possible.

Permanent pastures will usually be the basis of the pasture program. Properly established with adapted legumes and grasses on good soil, and properly fertilized and efficiently managed, they will provide earlier grazing in the spring and later grazing in the fall, as well as more abundant grazing throughout the season.

Plans should also be made to provide additional grazing at times of the year when the permanent pastures are inadequate, by seeding crops for temporary or supplemental pastures.

Set aside a part of the permanent pasture and topdress it with nitrogen fertilizer in early spring to provide earlier grazing.

If barnyard manure, phosphorus, and potash are applied to the entire pasture in the fall and nitrogen is applied to a part of the pasture in the spring, the nitrogen-fertilized portion will provide grazing some two weeks earlier than the rest of the pasture.

By the time the earlier growth is grazed off, the rest of the pasture should have from 4 to 6 inches of growth ready for grazing.

Temporary pasture crops, such as sudan grass, sweet clover, pearl millet, soybeans, etc., can be seeded in spring or early summer to provide grazing after the permanent pastures begin to fail. Wet areas should be seeded to adapted crops.

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Louisville, Kentucky, April 1950

Some of the permanent pasture should be reserved for late fall grazing.

Small-grain crops may be seeded in the fall for both late fall and early spring grazing. In certain areas, and on the right soils, such crops will furnish two to three weeks of the latest grazing in the fall and will provide the earliest grazing in the spring. In many areas these crops can be grazed at intervals throughout the winter.

Light, sandy soils with good drainage are best adapted for fall-pasture crops. On such soils in the South, seedlings of ryegrass and crimson clover, or seedlings of small-grain crops (oats, rye, wheat, or barley) with crimson clover, vetch, or lespedeza will furnish abundant winter grazing.

Plan to make pasture and hay crops a part of the regular crop-rotation system on the farm. Experiments now under way at Beltsville's Agricultural Research Center indicate that such a pasture-and-crop rotation is both feasible and profitable.

The five-year rotation includes corn for silage the first year, wheat for grain the second year, and grasses and legumes for pasture or hay the next three years.

To start the rotation experiment, a permanent pasture of Kentucky bluegrass and white clover was divided into a number of fields, one of which was left for comparison with the rotation crops and fertilized in the same way.

The pasture sod was manured (ten tons per acre) and plowed in the fall for corn the next year. The corn was ensiled and 400 pounds of 0-14-14 fertilizer was applied per acre on the stubble, which was then disked and seeded to wheat (one bushel) and orchard grass (six pounds) or bromegrass (ten pounds). In the following spring three pounds of red clover and two pounds of ladino clover were broadcast in the wheat. The wheat was threshed for grain, and the stubble and new seeding was grazed lightly in the fall. The next three years, the field was in grass and clover which was used for pasture or hay. An additional 400 pounds of 0-14-14 fertilizer was applied in the fall of the second year of the grass-and-legume pasture.

The average yield of nutrients in the corn, wheat, and grass-legume pasture and hay crops over the five-year period was 16 per cent more than the yield from the permanent pasture, which received the same fertilizer treatment. Moreover, when summer rainfall was below normal, the rotation system provided more grazing in the late summer and fall months than the permanent pasture—a time when more grazing is usually needed.

Will Irrigation Pay On Your Farm?

Condensed from New Jersey Farm and Garden

Samuel H. Reck, Jr.

"WILL irrigation pay on my farm?" That's a $64 question and there are about 64 angles that a person has to explore before he can come up with the right answer.

Some of these concern the availability of water, the kind of crops being grown, the type of soil, the layout of the fields on the farm, the weather, market prices, and so on.

Take that first one—is water available? The most expensive irrigation equipment in the world won't be worth a plugged nickel if a reliable source of water isn't available.

This question was discussed in some detail at a recent series of irrigation meetings in New Jersey by Henry C. Barksdale, of Trenton, district engineer for the Geological Survey, U. S. Dept. of Interior.

Mr. Barksdale explained how big a source of water would be needed to supply an inch an hour to the acre. An inch an hour per acre would require a flow of about a cubic foot per second, 450 gallons a minute, or a little over 27,000 gallons an hour.

The amount of water needed to cover an acre one inch deep would fill a reservoir 30 feet long, 12 feet deep and 10 feet wide.

Geologists measure the flow of streams in cubic feet per second or "second feet" as they sometimes say. A stream flow of one "second foot" would be the yield of a drainage area of four or five square miles in dry seasons, according to Mr. Barksdale, but the average yield of New Jersey's streams is something like 1½ cubic feet per second in one square mile.

The Geological Survey maintains about 75 "gauging stations" distributed throughout the state to measure the flow of streams. They have found that in a dry period if your stream has a drainage area of five square miles, it should produce a cubic foot of water per second. This would provide an acre-inch of water for 24 acres during each 24-hour period.

The Geological Survey may not have a gauging station on the particular stream in which you are interested but they can give you a good estimate of the probable yield of that stream.

If the water flow in the stream

Reprinted by permission from New Jersey Farm and Garden,
Sea Isle City, New Jersey, April 1950

that goes past your place is only about enough for your needs, better make sure that two or three other farmers aren't planning to draw from that stream.

If surface water in the form of streams, ponds, or lakes is not available, you may be able to get the necessary supply from a well—although this will increase your costs considerably. That part of New Jersey lying south of a line drawn from Trenton to Perth Amboy is known as the coastal plain area. In general, wells capable of producing 450 gallons of water per minute can be developed in most parts of the coastal plain, although in some places the Geological Survey believes the safe yield has been exceeded by the digging of too many wells.

A second group of localities where farmers might get a well capable of producing 450 gallons per minute is in the gravel-filled pre-glacial valleys in the northern part of the state. If you are on high ground, however, and if hard rock occurs close to the surface, you might as well give up the idea of irrigation, so far as a well is concerned. There are, of course, many streams in that area that might provide the necessary water.

There are legal restrictions governing the drilling or digging of wells in certain areas, and also the taking of water from streams, so it is a good idea to get in touch with the Division of Water Policy and Supply, Department of Conservation and Economic Development, Trenton. Or your county agent might be able to give you some useful information.

It is obvious, of course, that irrigating from a well is more expensive than with surface water. First there is the expense of digging or drilling the well. In some areas it may be necessary to go down 100 feet or more. Pumping equipment that will lift water from a deep well will cost about twice as much as equipment for pumping from a stream or lake. And the operating costs are higher, too.

Assuming that water is available, you still haven't answered the $64 question as to whether irrigation will pay on your farm.

As a general rule, irrigation pays best on the more intensive crops. Truck farmers have used irrigation successfully for years. Studies by the Experiment Station have shown that over a period of years, irrigation will return profits on New Jersey potato farms. Naturally the return is greater in drought years than in normal ones. Last year in many cases irrigation meant the difference between getting a crop or getting practically none.

At New Brunswick last year Katahdins irrigated nine times with a total of 12 inches of water for the season produced 333 bushels as compared with 175 bushels

for non-irrigated. This was on land under continuous cultivation. On land in a two-year rotation the dividends from irrigation were even greater—407 bushels for the irrigated as against 192 for the non-irrigated.

Some sweet corn growers have tried irrigation and a number of large fruit growers have done likewise. How much it has returned in increased yields is debatable.

On pasture and hayland there is a difference of opinion, too. The Experiment Station has conducted some limited research on pasture irrigation but not enough to warrant recommendations. Cornell University, however, recently estimated that the average New York dairyman could increase the carrying capacity and feed production of his pastures by 20 to 40% by putting on plenty of water at the right time.

D. W. Ruedemann, of Plainsboro, is a strong believer in the value of irrigating legume hayland. On alfalfa, he puts fertilizer on three times—after each cutting. He puts on 300 pounds of 5-10-10 each time, washing it into the soil with an inch of water. That starts the new growth in great fashion, he claims. Last year he got four cuttings of alfalfa despite the drought. He cut between five and six tons per acre. He also irrigated his pasture land and reports a one-third increase in feed produced.

However, one dairy farmer who has purchased irrigation equipment doesn't plan to use it this coming season. He figures it took too much work and interfered too much with other farm work. He is putting his faith in dry-weather forage crops such as sudan grass.

Carl Bender, grassland expert of the dairy department at Rutgers, believes that too many farmers go at irrigation on a hit-and-miss basis. Pasture and hayland irrigation should be done on a carefully-planned basis. "If it rained on the day I was going to irrigate I'd go ahead and do it anyway," Bender declared. "If a farmer changes his plans because it looks like rain, he might hold off 10 days or more with the grass getting a setback from which it won't recover."

W. C. Krueger, extension agricultural engineer at the State University, has this to add: "The most important message I can give to any farmer contemplating the irrigation of his farm crops is to study the principles of water application." Kruger states: "He must get to know the characteristics of the various types of soil on his farm, and their ability to absorb water without run-off and erosion. He must learn how plants use water and water requirements of different crops."

Kruger who is chairman of the irrigation committee at the Experiment Station, feels that many

farmers have done more harm than good to their crops and fields by failing to learn the principles governing when and how much water to apply.

Irrigation, it would appear, is pretty much of an individual problem. Your irrigation dealer is a good source of information for conditions in your locality by reason of other customers' experiences.

Secret of Corn Borer Control is Good Timing

Shoot, not when you see the "whites of their eyes" but when you see the tassels, is the trick to getting good control of the European corn borer, according to Neely Turner, entomologist at the Connecticut Agricultural Experiment Station.

The secret of successful control is a matter of timing, his researches have shown. The corn borer doesn't do much damage except on corn that is ready to harvest at the time the borers are reaching full growth. Treatment then is too late. The time to "get" the pest is when the young borers are hatching and even that is qualified. Young larvae cannot survive on corn plants too small to have a tassel. The appearance of the tassel is the signal to put on the first application of spray or dust. Check the plants frequently, Mr. Turner says, and as soon as half of them have tassels that can be seen by looking directly down into the plant, get out the sprayer or duster.

Corn that can be expected to need protection is the crop maturing the first three weeks of July and the late crop which ripens late in August and during September. Those are the periods when the two generations of the borer are in the larval stage when they feed on corn. Corn maturing at other times is not usually seriously damaged.

Best results from his extensive experiments, Mr. Turner says, were shown when the dust or spray was directed at the whorl of the young plants and on the ear shoot when it developed. Coverage of the entire plant gave poorer control. Applications must be frequent for good results; about five days apart is the general rule. DDT and Ryania were the materials giving highest mortality of the borer.

Report of Progress
Connecticut Agricultural Experiment Station

Spraying Vegetables To Control Weeds

Condensed from Farm Research

R. D. Sweet and C. W. Terry
Cornell University

COTTON GROWING in Mississippi seems like a far cry from vegetable growing in New York, but a mutual problem of both industries—weeds—may bring them closer together.

A suitable economic means of controlling weeds on southern cotton plantations has long been desired. Flame guns mounted on cultivators to kill small weeds in the rows of cotton proved only partially satisfactory. Experiments using Stoddard Solvent, the same material now used for weeding carrots, were made at the Delta Experiment Station in Stonesville, Miss. This work indicated that cotton and lima beans are relatively tolerant of low-gallonage stem applications of the solvent.

With this information as a basis, greenhouse tests of an exploratory nature were undertaken at Ithaca early in 1949 to determine possible additional crop tolerances. These tests indicated that all types of beans, as well as the large-stem members of the cabbage family and sweet corn, probably would be tolerant of stem sprays of several herbicides.

Although selective herbicides have been developed for several vegetable crops, including carrots, corn, peas, onions, and beets, a large number still cannot be selectively weeded. The pre-emergence method has been helpful in some areas and for certain crops, but at best, would only be considered as a stop-gap if a selective treatment could be discovered. It has been found that if the leaves of a plant were sensitive to a particular weed killer, it did not necessarily follow that the stems were equally sensitive.

During the growing season of 1949, several field experiments were conducted with cauliflower, broccoli, cabbage, sweet corn, snap beans, lima beans, and field beans. All of the field weed-killer applications were made by means of low-gallonage directional spray equipment constructed at Ithaca.

The shoes that covered the nozzles were made from a design by O. B. Wooten, Jr., of Mississippi. These shoes were mounted on a Farmall A. V. tractor in place of the two inside cultivator teeth which straddle the row. The

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Geneva, New York, April 1950

height could be adjusted at will through a hydraulic "touch control" mechanism. Guards to pick up the plants and prevent their being sprayed were fashioned out of sheet metal and fastened to the shoes. The whole nozzle, support, and guard "floated" over the ground close to the plant row and allowed application of the spray material to the weeds while getting only a very small amount on the plant stems and a few leaves.

Three different field experiments were conducted. In experiment 1, snap beans, limas, and kidney beans were sprayed with pentachlorophenol, Stoddard Solvent, potassium cyanate, dinitros, and several combinations of some of these chemicals. An 8-inch band was actually sprayed. Yields were not reduced by any treatment nor was time of maturity affected.

Since the first experiment indicated that stem sprays were feasible for beans, a second experiment was designed to determine if frequency and total quantity of spray would influence crop response. Starting at first bloom of snap beans, sprays were applied at intervals of 3 and 5 days. When the treatments were terminated, some of the plots had received four and others three applications. Yields in about one-half of these treated plots were reduced, in contrast to the slight injury from one application in the first experiment.

In experiment 3, cauliflower, broccoli, cabbage, and sweet corn were sprayed with sodium pentachlorophenate, pentachlorophenol, potassium cyanate, dinitro, Varsol No. 1, and Esso 45 in varying concentrations, all at 45 gallons per acre. All crops were sprayed once, with the exception of sweet corn which was sprayed twice. As with the one-spray treatment of leaves, there was no reduction in yield.

Most, if not all, of the sprays that gave satisfactory weed control caused some damage to the crop where the material hit the stems. In practically every instance the most severe injury was just below the ground level. It is thought that this may be corrected by decreasing the gallonage. With beans and members of the cabbage family, the epidermis was killed and turned mahogany brown in color. In most instances, this dead tissue penetrated no further than the phloem or outer conducting tissue—often not even that deep. Heavy applications of the oils, especially Varsol on beans, sometimes went all the way through, killing the stem and allowing it to snap off. Usually, however, not more than 25 per cent of the phloem was destroyed and none of the interior tissues damaged.

The seriousness of such phloem destruction may depend on the stage of growth at which it occurred. In older plants it would

be expected to be less harmful, perhaps might even be slightly beneficial; in young plants it could be quite serious. With corn the outer sheath tissues became bleached but, with the exception of the Varsol treatments, this did not appear to be particularly serious.

Since the principle of stem application is to apply the spray material close to the ground, it is obvious that the weeds must be small at the time of treatment; otherwise they escape serious injury in the same manner as do the crop plants. An exception to this is found in grasses sprayed with oil. Even when the grass is 6 to 8 inches tall, an application of oil on the lower part of the stems seems to penetrate and seriously affect them. Creeping weeds, such as portulaca (purslane) and knotweed, are particularly vulnerable since practically their whole surface can be covered even on plants several weeks old.

From preliminary studies with several vegetables it appears that chemical weeding by means of stem sprays with any one of the several herbicides is feasible. Considerable work needs to be done, however, to determine proper dosages, timing, best chemicals, and crop tolerance.

White Man Plumb Loco

When lengthier sermons on soil conservation are forgotten, this succinct "Injun" yarn still will be enjoying circulation. A farm journal, the Farmer-Stockman, printed a picture of a deserted farm house and gullied field, offering a $25 prize for the best 100-word description. Here's the winning entry as quoted by Outdoor America:

"Picture show white man crazy. Cut down trees. Make big tepee. Plow hill. Water wash. Wind blow soil. Grass gone. Door gone. Window gone. Whole place gone . . . . Buck gone. Squaw, too. Papoose gone. No chuck-away. No pigs. No corn. No plow. No hay. No pony.

"Indian no plow land. Keep grass. Buffalo eat grass. Indian eat buffalo. Hide make tepee. Make moccasin. Indian no make terrace. No build dam . . . . All time eat, No hunt job. No hitch hike. No ask relief. No shoot pig. Great Spirit make grass. Indian no waste anything. Indian no work. White man he loco."

—Denver Post

Grass Makes Beef

Condensed from The Dakota Farmer

James J. O'Connell

BEEF CATTLE lead all classes of American livestock in the consumption of grass and grassland crops. They use about one-third of the permanent pastures, three-fourths of the range areas, and a high percentage of the harvested crops. Grass usually represents the principal and cheapest feed of beef cattle. Pastures can be regarded as a costly source of feed only on highly productive farm land. But, even on such land, grass fits perfectly into the rotation program, holding lands against erosion, bringing profits from lands "at rest," and increasing yields when row crops come back in regular rotation.

The farmer with the lowest production costs and the best conservation practices is the one who will come through best, both in income and maintenance of his capital (that is, his soil).

Some grasses return many more dollars than others. What producers attempt is to displace as much cash grain as possible by better forage that will increase incomes by more pounds of meat per acre.

About 12 billion pounds of dressed beef and veal were produced in the United States in 1947 through the conversion of grassland crops into meat by cattle. The quantity of forage required to produce this huge output of meat is indicated by the average daily requirement of beef cattle. An average beef animal consumes at least 50 pounds of green or succulent forage daily in humid locations and probably about half that quantity in drier areas.

Alfalfa-grass mixtures have been used satisfactorily for beef production in various sections. Smooth brome grass-alfalfa mixtures are recommended as a means of lengthening the grazing from April through October. In the Pacific Northwest, M. E. Ensminger, Washington agricultural experiment station, found that a grass-alfalfa mixture produced nearly three times as much beef per acre as pure grass pastures of smooth brome grass and crested wheat grass. The alfalfa with smooth brome grass produced 225 pounds of beef per acre in 87 days as compared with 84 pounds in 80 days for smooth brome grass alone. Alfalfa with crested wheat grass produced 218 pounds of steer gain in 87 days as compared with 90

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pounds of gain in 85 days from crested wheat grass alone. The average carrying capacity of the mixtures was 4.28 steer months per acre, as compared with 1.62 for the pure grass pastures.

At the South Dakota state college experiment station, on summer grazing trials, it was estimated on the terms of beef produced that land in eastern South Dakota growing a good alfalfa-brome pasture may be worth $75 or more per acre based on present meat prices, as compared to $18.00 per acre for native blue grass in the same area under the same conditions. These figures are based on trials conducted on alfalfa-brome pasture and native bluegrass pasture where steers of equal quality were put on these two types of pastures.

Crested wheat grass pastures have rapidly replaced smooth brome grass in cultivated pastures in the Northern Great Plains of which Dakota is a part. It is an early-grazing and a late-grazing plant which works in very nicely with a rotation of the native range.

Crested wheat grass pastures have produced greater total gains per steer per acre than either native grass or smooth brome grass pasture at Moccasin, Mont., since 1934, according to R. M. Williams and A. N. Post. Crested wheat grass furnished grazing about three weeks earlier in the spring than native grass and two weeks earlier than brome grass.

Ten-year average weight gains per animal were 239, 207, and 233 pounds, respectively, with the crested wheat grass, native grass, and brome grass. Annual weight gains per acre were 78.6, 36.9, and 54.4 pounds respectively. These results indicate a decided advantage for crested wheat grass, as measured by earlier grazing, longer grazing season, higher carrying capacity, and greater beef production. Brome grass was intermediate between crested wheat grass and native grass in most respects.

Experiments at Ardmore, S. D., showed that crested wheat grass and western wheat grass had similar value in producing gains on two-year-old cattle. The introduced grass supported more cattle and produced 41 pounds more gain per acre.

Many trials and experiments have been conducted on grass and beef production, and it is hoped that more producers will be stimulated to work towards a pasture program which will lead to more economical production of beef.

Hawks and Owls

Condensed from American Poultry Journal

James F. Bent

SAY "Hawk" to the average farmer, and he looks for his gun. To him, a hawk of any kind means just one thing—a killer of his flocks. "Shoot the varmint quick," he thinks, "before it has a chance to grab an unwary chicken, duck, or young turkey."

He looks upon owls much in the same way, especially the Great Horned Owl. Being night hunters, these birds are more difficult to control. Even the largest are as silent as a shadow in their quest for food, and their lightning swoop is as inescapable as death itself.

But only a few of the birds of prey are actually as destructive as the farmer pictures them. The others, even the largest and most powerful, are generally harmless to man.

There are only 3 hawks that are really destructive, and against which the farmer must be constantly on the alert. There are, in order of size, the Sharp-Shinned Hawk, Cooper's Hawk, and the Goshawk. They are the sinners for which the gun must be kept oiled and ready.

But the other hawks, such as the Red-shouldered and Red-tailed, are more sinned against than sinning, and are often given an unfair reputation as chicken thieves. With few exceptions, they wouldn't even look at a chicken as long as there were plenty of rats, mice, gophers, ground squirrels, etc.

Most hawks would prefer to live on this wild or semi-wild game rather than bother with chickens or other domesticated fowls. And the same is true of owls. It is only the individual member of these species that acquires a taste for the easier hunting in the barnyard.

The Sharp-shinned and Cooper's might easily pass for one species of hawk, so closely does their plumage match. Both birds are a dark slatey-blue above and white below, the chief difference being in size. The Sharp-shinned is only about a foot long, while Cooper's is 18 to 20 inches in length. In both, the female is the larger.

Also, Cooper's hawk wears a sort of black skull-cap and has a rounded tail, while the other species has a square tail and no cap. Outside of these 3 differences, they are twin brothers in all other respects.

Reprinted by permission from American Poultry Journal,
Chicago, Illinois, April 1950

The Goshawk looks like an older brother of the other 2 rascals. Its generous coloring is also slatey-blue above and white below. However, it can be easily told from its partners in crime by the broad white streak just over each eye and extending to the back of its head, giving the effect of a burglar's mask to the darker feathers below.

All 3 are unbelievably bold in their lightning attacks on domesticated fowls. A young chicken may be pecking corn a few feet from the farmer. Suddenly there is a rush of wings, a blue streak skimming low across the ground, a frightened squawk, and the chicken is gone before the farmer can turn around.

The chicken is rarely able to dodge the swoop unless it is a member of one of the more active breeds, such as the Leghorn. Or unless there is plenty of shrubbery under which it can duck when the attack comes.

Unfortunately the farmer must be on the alert for these 3 hawks over most of the United States and Canada. Also, they are probably the commonest of all hawks, and often the destruction they cause is blamed on the harmless species.

The harmless hawks include the red-shouldered and red-tailed. The latter is a little large, being 22 to 24 inches long, and the former 20 to 22 inches, about the size of the Goshawk. They are both unjustly named "hen hawks" and are often blamed for the crimes of the other 3 species.

While both of these hawks do occasionally take a chicken, it is usually an aged or diseased bird that would probably have to be killed sooner or later anyway.

As to the owls, most of them are wholly beneficial, especially the Screech owl and Barn owl. What the hawks do by day, the owls do by night and even more effectively, since most rodents venture out of their holes and do their destruction at night.

The Great Horned is the only owl the farmer needs to worry about, especially if it acquires a taste for young turkey. They often become fastidious eating only the brains of their victim and leaving the rest. Being big birds, sometimes over 2 ft. long, it takes a lot of brains to feed one—and a lot more to stop one!

But even these owls could be a great benefit to the farmer, for they really prefer their natural game, especially rodents, to any kind of domesticated fowls. And they are one of the few birds that can enjoy a meal of skunk.

But these hawk and owl raids on his barnyard are often the farmer's own fault. It is the policy of too many farmers to let their birds run wild, often ranging far out over the field where they are an easy mark for any day marauders. And at night, they are per-

mitted to roost in the trees where the owls can get them.

Plain common-sense says to keep them confined in a coop where they will be safe. But if not desired to keep them cooped up during the day, there should at least be enough close-growing shrubbery nearby under which they can duck when the three pirate hawks attack. And they should certainly be confined at night.

Cure Runty Pigs With Vitamins

Maybe runty pigs can be made profitable. Hope of that possibility comes from Michigan State College. Scientists there have been trying B-vitamins and grain balanced with proteins to make runts get over their troubles. They've had promising results.

Pigs that weighed only 20 pounds at 80 days old were fed a fortified ration 35 days and gained 42 pounds. Another bunch which weighed 19 pounds at 70 days gained 41 pounds in 34 days.

The 2 groups were part of a 2-year experiment. Other lots averaged gains from 0.71 to 1.21 pounds a day. Of the 80 pigs, 69 were completely cured by the treatment. Compare that 86 per cent recovery with the 66 percent survival (to market weight) of all pigs farrowed in the country.

In setting up the experiment, Michigan scientists hunted for the scrubbiest runts they could find. They wanted pigs which had "necro," a diarrhea but no temperature. They also wanted pigs that were being fed largely on corn, too little protein and no green roughage. Selections were made from herds in which 65 to 75 percent of the pigs were apparently healthy. The runts weighed 20 to 40 pounds whereas herdmates weighed 60.

The poorest of the deficient pigs were taken to the college for treatment. They were so miserable that they wouldn't eat enough for normal growth. So they were dosed with a solution containing 5 B-vitamins such as those used in fortifying bread. After that the vitamins were mixed with the feed. Diarrhea and enteritis cleared up gradually, within 5 to 21 days.

Michigan workers point out that most pigs made runty by lack of the right feed can be cured by giving the B-vitamins, but the smart job is to prevent the trouble. Pigs that get these vitamins in natural feed, such as proteins and pasture to balance grains, won't develop nutritional enteritis. The disease causes most of the losses that occur to each pig crop from weaning to marketing. Right feeding is the remedy.

—Capper's Farmer

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